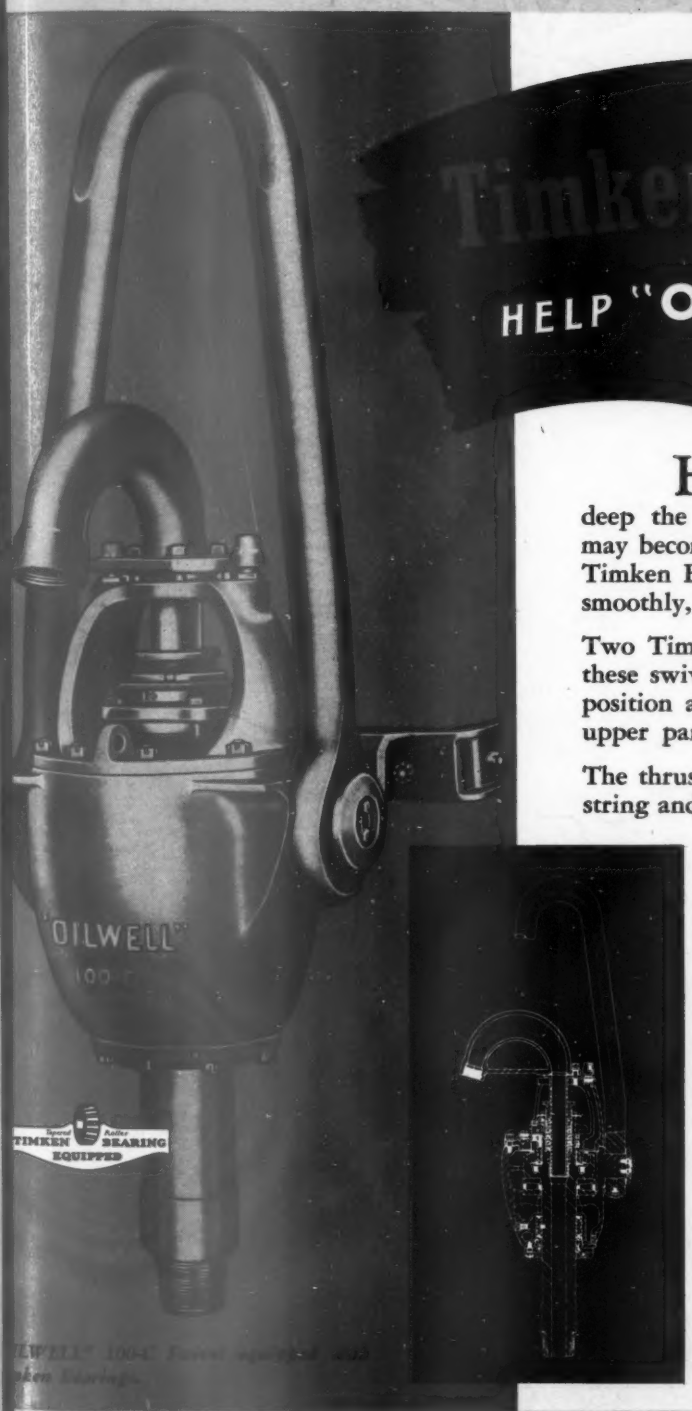
the OIL AND GAS JOURNAL



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TIMKEN

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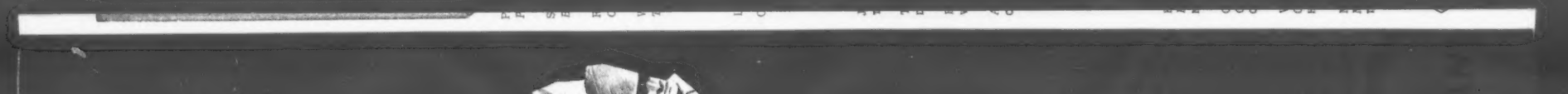

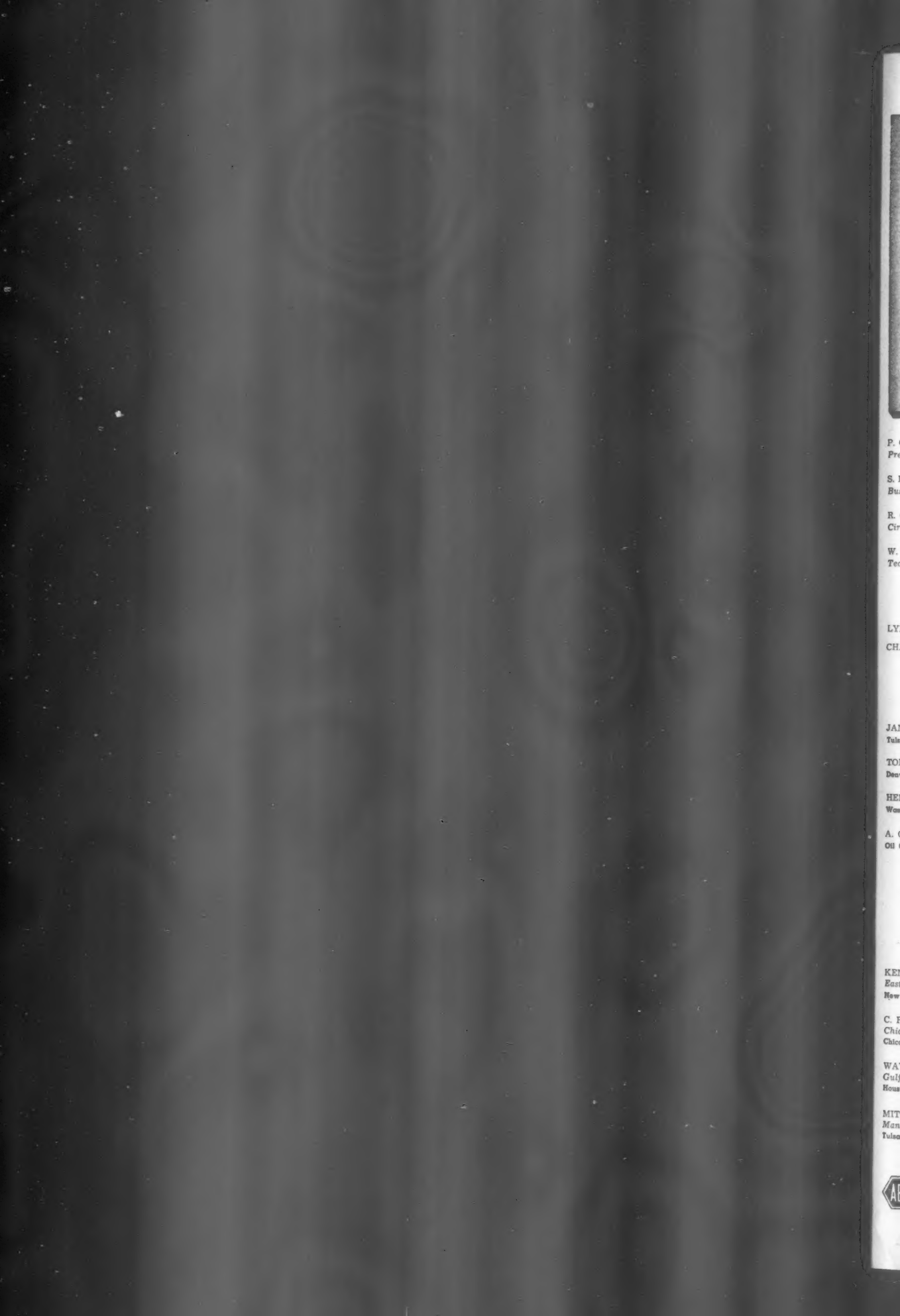

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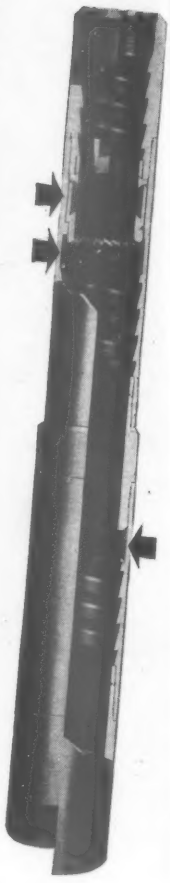
Photographs courtesy of Bowen Co. of Texas, Inc.



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HYCAR pack-offs *perform* in Bowen overshots

THE arrows in the picture to the right show the location of Hycar pack-off rubbers in the Bowen Series 200 Drill Pipe Overshot. Hycar was selected for this application because it was possible to get the right combination of properties essential for this particular service.

The requirements of this service are well known to every oil man—resistance to oil and gas, resistance to a number of different acids, resistance to high temperatures, plus the ability to stay resilient and provide a positive seal. Hycar meets them all.

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Synthetic Rubber

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Trends

Crude-Oil Production By States—Page 132

CRUDE-OIL STOCKS 222,390,000 bbl. as of September 30—up 900,000 bbl. One Year ago 234,643,000 bbl.

GASOLINE STOCKS 78,028,000 bbl. as of September 30—down 344,000 bbl. One year ago 69,260,000 bbl.

RESIDUAL FUEL-OIL STOCKS 64,226,000 bbl. as of September 30—up 1,712,000 bbl. One year ago 66,827,000 bbl.

GAS OIL AND DISTILLATE STOCKS 45,329,000 bbl. as of September 30—up 548,000 bbl. One year ago 39,806,000 bbl.

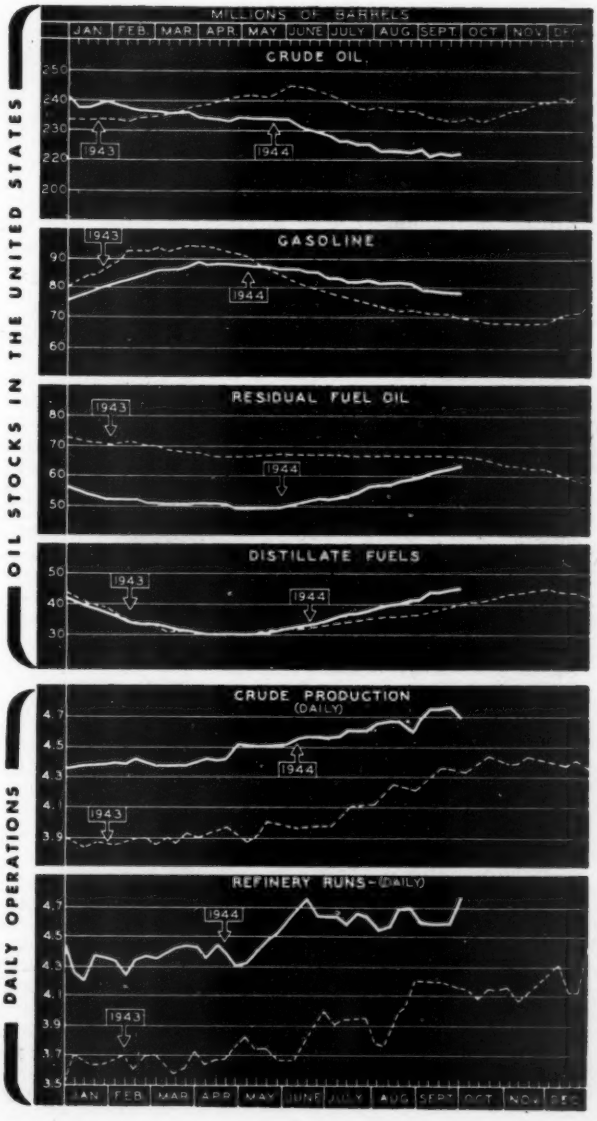
CRUDE-OIL PRODUCTION 4,697,350 bbl. as of October 7—down 60,850 bbl. One year ago 4,389,970 bbl.

REFINERY RUNS 4,775,000 bbl. daily week ended September 30—up 167,000 bbl. Year ago 4,204,000 bbl.

DISCLOSURE that 51.3 per cent of the currently programmed domestic postwar refinery construction expenditures has been earmarked for catalytic-cracking processes is significant in the manufacturing operations of the petroleum industry. Nearly 25 per cent of the projected immediate postwar expenditures for plant and process improvement is committed for lubricating-oil facilities. These two phases of postwar refinery construction account for 75.5 per cent of the anticipated domestic expenditures totaling $176,789,385. No specific time is set for prosecution of plans but plant operators are anxious to undertake the work as rapidly as materials permit.

THE time lag between approval and completion of construction is the chief reason why the Petroleum Administration for War has launched its study of domestic and foreign objectives of refiners. All pertinent data on postwar construction plans are being relayed to the War Production Board. PAW has suggested that "immediate attention to this pent-up demand should be appropriate" in prosecuting WPB's expressed intention to return rapidly to a peacetime economy to avoid depression. PAW shows that the nation's refineries have been operated at capacity for 2½ years. Current runs to stills are 800,000 bbl. daily above the peacetime level of operations. Much of the overload, PAW points out, is being handled through prewar facilities, building up a staggering backlog of replacement and rehabilitation requirements.

THE timeliness of PAW's representations to WPB cannot be questioned, particularly in view of the individualized design and construction considerations at postwar refineries. There is a normal gap of several months to more than a year between authorization of construction and the start of work at a new refinery site. The industry's ability to interpret improved engine design into higher quality motor fuels for the desired economies in postwar automobiles will depend largely on how promptly the WPB raises the barrier on: (1) Domestic refinery construction costing $176,789,385, and (2) foreign projects aggregating $176,155,000. The total of $352,000,000 is not represented as final or inclusive but is an impressive milepost in the postwar planning of the petroleum industry.



Anglo-American Agreement Receiving Renewed Study

by Henry D. Ralph

WASHINGTON. — The Anglo-American petroleum agreement is being restudied by the State Department and the Petroleum Administration for War in the light of the growing opposition of oil industry groups and particularly the bitter and detailed attack on it presented at the last meeting of the Petroleum Industry War Council by George A. Hill, Jr., president of the Houston Oil Co. and one of the 10 industry advisers to the State Department during drafting of the agreement.

A report is current in the industry that the agreement may be withdrawn from the Senate for ratification as a treaty, but this is not confirmed in Washington and in any event no action is likely to be taken until Congress reconvenes on November 14. The fact that PAW and the State Department are restudying the pact has given rise to a suggestion that it might be withdrawn as a treaty and put into effect as an executive agreement, which would not require Senate ratification, or that it might be revised after further consultation with the British. However, as far as can be learned definitely, the current studies are for the purpose of answering the objections of Hill and others.

All government officials are concerned over the growing opposition to the pact. They take the view that there must be some sort of working agreement between the United States and Great Britain, the two largest factors in the world oil picture, if international chaos is to be avoided after the war, and this view is also shared by many in the oil industry. The officials further believe that the present pact is about as simple and straightforward as could be drawn, and they feel that objectors are reading into it all manner of evil things which are not there and could not develop under any reasonable application of its terms.

Government men are slightly amused by the apparent about-face of many of the objectors. When the pact was under negotiation there was a great hue and cry that so important a subject should not be confined to an executive agreement but it should be ratified by the Senate after thorough discussion. Now that the president has submitted the pact to the Senate the objection is that an executive agreement would be more flexible and less restrictive, whereas if ratified as a treaty it would supersede the Constitution and all acts of Congress.

The distinction between an executive agreement and a treaty, according to experts in international law, is very hazy and indefinite, and their zones of use overlap. In general, but not exclusively, executive agreements are used to carry out the details of a general policy laid down by Congress or recognized by international law, such as shipping and navigation rights, postal and communications agreements, or settlements of monetary claims. One authoritative book states that in ratifying a treaty the Senate is bound by nothing except what it considers the good of the nation and a treaty may modify the Constitution, whereas an executive agreement must scrupulously abide by the Constitution and the acts and policies of Congress.

Limitations of Treaty

However, officials point out, a ratified treaty does not go beyond its own language. For example, the Constitution prohibits Congress from levying any tax on exports; a treaty might set this aside if it were specifically so worded, but in the absence of such a clause Congress could not impose an export tax in order to fulfill its obligations under a treaty.

Therefore, it is argued, objections to the treaty form are groundless, since there is no language in the petroleum pact (at least, they say, none was intended) which would give Congress or the executive departments any powers not now possessed. Executive officials might ask for new legislation to implement the pact but they could not ask for anything unconstitutional and Congress would be under no greater obligation to accept such recommendations than if there were no pact; neither would this situation be changed if the pact were a treaty instead of an executive agreement.

Under one controversial clause in the Anglo-American petroleum pact the two governments agree "that upon approval of the recommendations of the commission they will endeavor, in accordance with their respective constitutional procedures, to give effect to such approved recommendations." Government officials declare this means that the United States is limited by all its present constitutional procedures such as state rights and the traditional difficulties of getting Congress to enact just the legislation requested by executive officials. On the other hand, the Hill memorandum takes the view that if the pact is ratified as a treaty it will in itself create whatever new "constitutional procedures" might be considered convenient to implement any conceivable interpretation of the pact.

Senate Reservations in Prospect

Some objectors have suggested that the pact be revised to spell out limitations and restrictions and that it then be ratified as a treaty. Officials counter that this would be an unusual and cumbersome procedure, since it would be extremely difficult to negotiate with the British if further Senate reservations were in prospect.

One possible solution would be for Congress to enact a rather general law, containing whatever reservations are considered necessary, authorizing the president to enter executive agreements with other nations for orderly settlement of international petroleum problems. Such agreement could then be negotiated with any or all foreign nations without further submission to Congress, and could be modified from time to time; they could go no further than the law provided in any particular, but all parties to the negotiation would know in advance the attitude of Congress and the limitations on the powers of the executive agencies.

West Coast Tank-Car Subsidy Confirmed

WASHINGTON. — Extraordinary cost of moving approximately 20,000 bbl. of crude oil daily by tank cars from West Texas to Los Angeles, will be reimbursed by Defense Supplies Corp., it was disclosed here this week by Jesse Jones, secretary of commerce.

Government defrayment of the extra transportation cost in supplementing crude-oil supplies on the Pacific Coast was recommended by the Petroleum Administration for War and the secretaries of the War and Navy departments to meet rising military demands.

Interstate Oil Compact Group Denounces Proposed Anglo-American Treaty

by Charles J. Deegan

Engineering committee of the Interstate Oil Compact Commission: Seated—E. A. Stephenson, Kansas; John M. Kelly, New Mexico; E. DeGolyer, Texas (chairman); W. H. Carson, Oklahoma; F. M. Van Tuyl, Colorado. Standing—N. W. Shiarella, Kentucky; S. F. Peterson, Illinois; Alec Crowell, Arkansas; F. R. Frye, Michigan

THE proposed Anglo-American oil treaty in the form submitted by the President to the United States Senate for formal ratification was officially condemned in forceful language by the Interstate Oil Compact Commission in a resolution formally adopted October 7 at the commission's fall quarterly meeting here.

The official resolution, after pointing out that last April at New Orleans, the commission had adopted a program setting forth the importance of a national oil policy and outlining the general principles which should be incorporated in that policy, states that the proposed Anglo-American treaty is not in harmony with the principles previously set forth.

Last week's resolution objects specifically to the use of the treaty-making device to amend the Constitution of the United States which would vest in an International Oil Commission, or the Executive Department of the United States Government, or the Congress, powers in time of peace which are not now constitutionally vested in the federal Government. These powers are listed as: (a) To fix production quotas in the oil producing areas of the world, including the United States; (b) to make market allocations throughout the world; (c) to fix prices of oil and its products, or price ceilings, or what may be deemed "fair prices;" (d) to take jurisdiction over conservation regulations by making determinations of "sound engineering practices" to be effectuated by federal law or international agreement; (e) to regulate our domestic oil business in relation to the economic advancement of foreign oil-consuming or foreign oil-producing countries; (f) to surrender the control of import regulation and duties on foreign oil while the United Kingdom preserves "imperial preferences"; (g) to vest in an international oil commission the determination of "peaceable" and "nonpeaceable" countries as the basis for eligibility or banishment from international trade in oil, irrespective of whether our nation is otherwise on friendly terms and enjoys amicable relations with such nations; (h) to regulate "the production, processing, transportation, and distribution of petroleum" in the United States (except as to the now recognized constitutional regulation of transportation in interstate and foreign commerce); and (i) to legalize cartels.

States Must Be Ready

The I.O.C.C. also adopted a resolution calling attention to the fact that there was some opposition to the return to the states of the power to regulate oil and gas production at the end of the war. The attention of the governors and legislatures of the oil-producing states was called to the fact that in order to strengthen their claims to restoration of state authority the states must be in a position to perform the necessary functions and discharge their obligations, and that consequently the states are urged to perfect and strengthen their respective statutes and administrative agencies in the coming sessions of their respective legislatures.

A paper on "The West Edmond Oil Field" by Dean McGee, executive vice president of the Kerlyn Oil Co., covering the history, geology, drilling, production, engineering and conservation phases, featured the Friday morning session. Projecting the drilling rate, McGee concluded that there would be 530 wells producing 92,750 bbl. per day by June 1, 1945, and that the ultimate recovery would exceed 100,000,000 bbl. and might reach 175,000,000 bbl.

Stating that evidence to date from bottom-hole-pressure decline and history of water encroachment seemed to fairly well establish the field as a gas drive type pool and that the oil is saturated with gas, McGee thought that a gas cap or series of gas caps would develop later and that there never would be a serious water problem. He thinks many of the wells will be produced to exhaustion without making water.

Flooding Reports Commended

The Bureau of Mines received kind words from the commission in a formal resolution commending two recent flooding reports on Kansas and Illinois. A resolution of appreciation to Oklahoma's Governor Kerr, the Oklahoma Corporation Commission, the Oklahoma City Chamber of Commerce and Oklahoma oil men closed the session.

In addition to the commission's formal action, oil operators convened in a separate luncheon session October 7 unanimously adopted a resolution condemning the proposed Anglo-American oil treaty in its present form. Steps were taken to bring the matter before the various oil and gas associations in the Mid-Continent area and adoption of similar resolutions will be urged upon them by numerous oil men.

Action condemning the oil agreement was the climax of a 3-day session throughout which both the of-

ficial program and the extemporaneous comments revealed a definite trend toward strengthening the compact in its internal organization and at the same time working for the acceptance of its basic principle of voluntary cooperation as the pattern for an international oil policy to be sponsored by the United States.

States which are not now members of the compact will be solicited to join, not only in the interest of conservation of oil and gas resources, but also on the grounds that it offers an agency to fight encroachments of federal and international authority on states rights. The commission expressed its appreciation for and encouragement from the attendance of unofficial representatives from Florida and California, which are not now members of the compact.

The Interstate Relations committee is working on a "Handbook on Conservation," which is aimed at explaining the benefits, principles and workings of state conservation laws. This book, which is to be written in nontechnical language will be directed to the attention of the citizens and legislators of states which do not have such laws, or in which present laws seem inadequate in the light of technological progress.

The committee on Public Lands presented a report which endorsed the action of a meeting of oil operators in Denver recommending revision of the Land Leasing Act of 1920. The committee reported success in its efforts, together with other organizations, to persuade Congress, to eliminate the reservation of mineral interests by the federal Government in the Surplus Property Act as finally passed by Congress, and reported the signing by the President of the United States of S-2111, which extended to December 31, 1945, those leases on the Public Domain which would have otherwise expired December 31, 1944, for lack of drilling. The committee expressed its opinion that representatives of public land states should give immediate study to and agree upon the form of an entirely new act concerning the development and disposal of public lands.

The Regulatory Practices committee announced that it expected to report soon on "The Functional Uses of Natural Gas" and this analysis will be awaited with interest in view of the action of the compact in condemning the encroachment of the Federal Power Commission on states rights in its proposed investigation into the production and use of natural gas.

The Research and Coordinating committee announced that it had completed discussion of the use of bottom-hole-pressure data in conservation and proration work and will submit a formal report prior to the next quarterly meeting. The committee reported that it considers bottom-hole-pressure information essential to the control of certain types of reservoirs. Inasmuch, however, as the type of reservoir recovery mechanism (water drive, gas drive, etc.) is seldom apparent in the early stages of a pool's development, it will recommend that bottom-hole-pressure data be systematically obtained in all new pools until the type of reservoir-recovery mechanism has been determined definitely and it is known whether pressure control will be feasible. The next meeting of this committee will be devoted to a discussion of proration formulae.

Committee Project Continuing

The Engineering committee is continuing preliminary work on its project of collecting data and assembling in book form a study of the research and engineering work which has been done in recent years on reservoir-control and oil-recovery problems. The committee agreed that there was a great need for a comprehensive study of limestone reservoirs.

Joseph E. Pogue, chairman of the Economics committee, informed the commission that there might be a report at the next meeting on the immediate postwar situation, depending on how much information is released by the Government after the current revision of probable military demands at the end of the European war. The magnitude of even the interim problem was emphasized by data reported in the paper presented by Ralph T. Zook, president of the Independent Petroleum Association of America, indicating the immediate postwar probability of an excess world production of 600,000 bbl. per day without considering any increased postwar development in the prolific Persian Gulf region.

In a later session, Pogue discarded his prepared paper on "The Purpose of an International Oil Agreement," stating that most of the audience could read it (see The Oil and Gas Journal, October 7, p. 56) and made an extemporaneous talk, most of which was "off the record." However, he made one important point officially, namely, that the petroleum industry in condemning the proposed Anglo-American oil treaty, was not indulging in merely destructive criticism, but had offered, even prior to the formulation of the present treaty, constructive and sound proposals in detail as to the principles and machinery that should be incorporated in an American foreign oil policy, and that these were outlined in the report of the Foreign Operations Advisory committee of the Petroleum Administration for War, in December 1943, and later were approved by both the Petroleum Industry War Council and the Independent Petroleum Association of America.

Visitors from opposite sides of the continent at the compact meeting: R. W. Ervin, Jr., assistant attorney, Florida; F. Elgin Bayless, state land agent, Florida, and E. Huegenin, assistant state oil and gas supervisor, California

Mexico Pays Installment Under Oil Agreement

WASHINGTON. — A check for $4,085,327.45 was presented to the secretary of state by the Mexican charge d'affaires ad interim last week in payment of the installment due under the agreement effected between Mexico and the United States concerning expropriated oil properties. The balance of $12,255,982.35 is to be liquidated over a period of 3 years by payment of $4,085,327.45 on September 30 of each year. Total payments will amount to $29,137,700.84.

Deep-Drilling Rigs to Be Sold by Government

WASHINGTON. — Defense Plants Corp. is preparing to ask for bids for the sale of three deep-drilling rigs with parts, accessories and a supply of tubular goods just returned to California from New Zealand where they were used by Army engineers in exploratory work.

THIS WEEK

PRODUCTION—After recording all-time peak, national daily output declines 60,850 bbl. . . . Principal recession in Texas and Kansas . . . ¶September added 57 new prorated wells in Kansas, compared with 62 in August, but September wells pumped 41,289 bbl. daily, contrasted with 45,807 bbl. of new daily production in August. . . . ¶Army antitank guns shoot christmas tree off casing at discovery well in De Soto Parish, Louisiana, which had been burning out of control. . . . Practice shells inadequate, but battle ammunition does the job. . . .

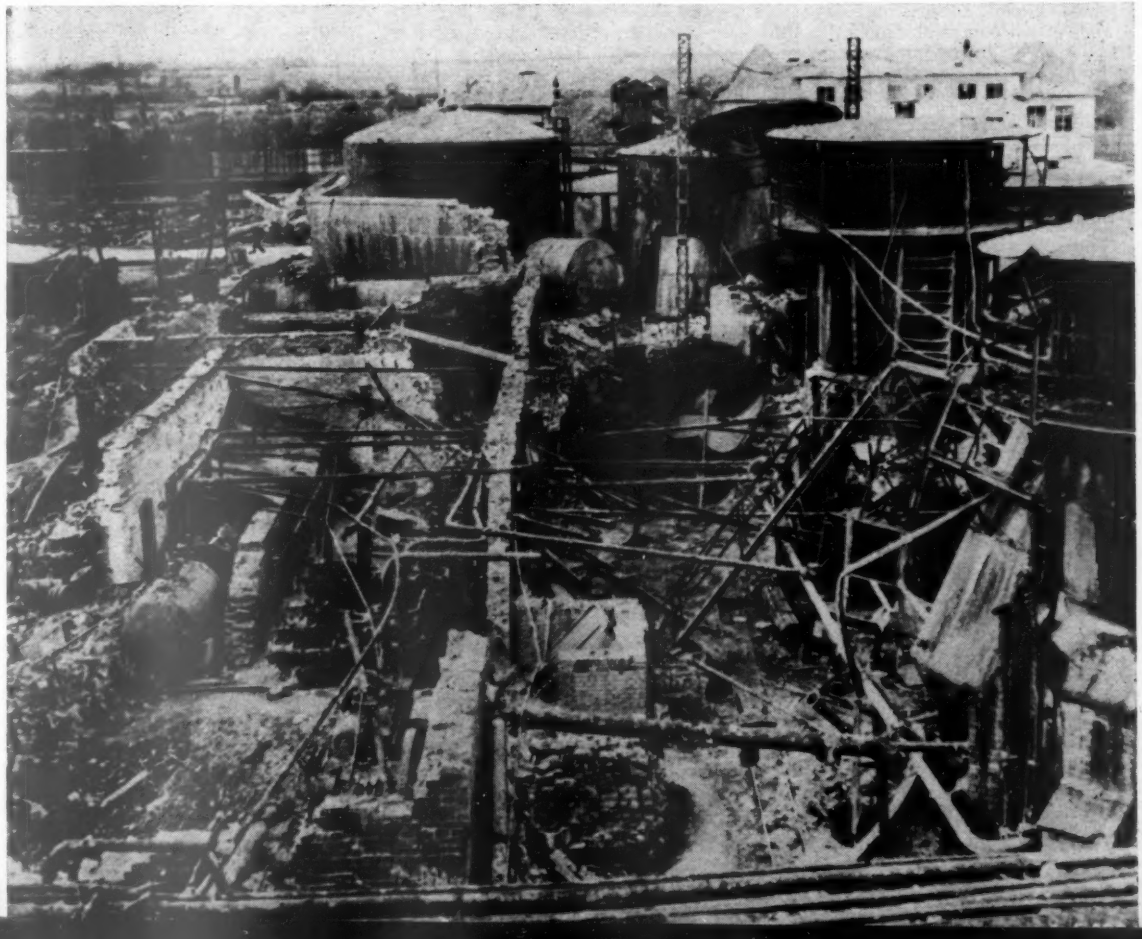
SYNTHETICS—Goodrich announces it is producing tires from Russian dandelion. . . . Grows in Florida Everglades, yielding 200 lb. rubber per acre. . . . ¶Office of Synthetic Liquid Fuels established in Bureau of Mines to conduct 5-year program designed to find new ways of producing oil and gasoline. . . . ¶R. L. Savage, Rubber Reserve Co., says 65 per cent of all synthetic rubber will be made from petroleum. . . . Alcohol formerly chief base. . . . ¶Celanese Corp. constructing $5,000,000 plant to produce 10,000 tons of butadiene annually for making synthetic rubber. . . . ¶Texas expected to be major field for oil-rubber manufacture. . . .

REFINING—Facilities costing $352,000,000 to be constructed by United States oil interests as soon as materials are available, PAW says. . . . Estimates $176,789,385 domestic expenditures and $176,155,000 foreign. . . . No estimates for rebuilding of installations in enemy-occupied areas included. . . . ¶Complaints that tank-car loads of gasoline have been destroyed by Army because it was substandard to be investigated by House committee. . . . ¶Refinery employment expanded substantially in July, and wage average up, Bureau of Labor Statistics reveals. . . . ¶Kerosene stocks at all-time high. . . . Residual storage problem more acute. . . .

FOREIGN—Colombia extends Tropical Oil concession, long in dispute, to 1951. . . . Would have expired in 1946. . . On expiration, all company's property goes to Colombian Government. . . . Expected to prompt orderly development and eventual management for Government. . . . ¶George A. Hill, Jr., says "new dealers don't want discussion of Anglo-American pact now for fear it will be a campaign issue." . . . Suggestion offered that pact be withdrawn as treaty and put into effect as executive agreement, with no Senate ratification requisite. . . .

Allied entry into Romania makes possible this ground-level shot of the vast destruction caused to Ploesti's oil industry by Allied attacks. Looking down from the central power-house stack, this is the shambles presented by the Concordia Vega refinery after being well hit by Allied raiders. This is one of the plants which the Romanians agreed to restore to prewar condition

Official U. S. Army Air Forces photograph. From International News Photos.



Contractors Told That Drilling Must Increase

by Nell Williams

FORT WORTH. — The oil industry faces the prospect of a great increase in the amount of drilling that must be done to discover new petroleum reserves, E. DeGolyer, Dallas geologist, declared at the fourth annual meeting of the American Association of Oilwell Drilling Contractors here October 3 and 4. Current technique of discovery is being exhausted, he said, making it necessary to resort to the drilling of a much larger number of wells if the remaining undiscovered fields are to be found.

DeGolyer expressed the opinion that the bulk of oil yet to be found must come from stratigraphic traps which are more difficult to isolate than the structural type of fields. There are no known methods of locating stratigraphic traps, he explained, except by drilling of wells. Under these conditions, he said, the discovery of future fields may require from four to five times as many wells as needed for the fields which have been opened on other types of traps and structures.

In the case of a stratigraphic trap, it is necessary to "dig out" not only the oil but also the prospect, DeGolyer added.

There is a great shortage of drilling now needed to replace the country's reserves now being depleted, he pointed out. Present reserves are being drawn on faster than new fields are being discovered to take their place, he continued, and current results of exploration are not encouraging. "Intelligent" exploration is at its highest level, but fewer discoveries are being made for the amount of work being done. The urgency of increased exploration and drilling was stressed.

Reserves Still Unfound

Estimating that the United States ultimately will produce approximately 100,000,000,000 bbl. of oil, he cited that about half of this already has been discovered, leaving approximately 50,000,000,000 bbl. of reserves yet to be found. He stressed the point that the country must depend upon new flush production to supply the bulk of its needs. Two-thirds of the current production is coming from fields opened since 1928, he recorded. Also, he continued, about two-thirds of the known remaining reserves are in the top 100 fields of a total between 4,000 and 5,000. Discussing the decline in discovery rate and depletion of reserves and need of additional exploration, he stressed the point that during the period 1933 to 1938, inclusive, 22 top fields were opened, but that since then, an equivalent period only six or seven such fields have been found.

Prospects for expansion of operations for drilling contractors in foreign countries also were discussed. Operators are becoming increasingly interested in development of reserves in Latin American countries, and with this a new field of work for contractors is being opened, he indicated. He expressed the opinion that contractors should be able to operate in these countries on the same basis as nationals.

Contractors were warned by James E. Pew, director of the Natural Gas and Natural Gasoline Division, Petroleum Administration for War, Washington, that they are confronted with an acute shortage of butane for drilling fuel. This month's shortage of butane for general consumption will total approximately 5,000,000 gal., and the shortage will increase monthly, reaching a peak of 7,000,000 gal. in January, he estimated. There just isn't any more butane to be had to make up this shortage, and as the needs of household consumers depending on butane for fuel must be served first, use of butane by the drilling industry must be curtailed greatly.

Questioned as to whether an order would be issued prohibiting use of butane for drilling rigs except on exploratory wells where other fuels are not available, Pew said that such an order was being contemplated but that he hoped the industry would undertake the program on a voluntary basis and that it would not be necessary to issue the order.

Use of Butane-Fuel Rigs

Pew estimated that there now are from 600 to 700 drilling rigs using butane for fuel and expressed the opinion this number should be cut by as many as 200. Exploratory wells must be kept going, and where butane is required, a special effort will be made to supply it, but the use of butane in fields where gas or other fuel is available or in areas within a reasonable distance of other fuel supply must be stopped, he declared. He cited an instance of one field in which 25 butane rigs are running although 3,500,000 cu. ft. of gas is blowing to the air daily.

Efforts will be made to encourage the drilling industry to make greater use of propane as a substitute for butane where possible, Pew stated. There is some excess propane, he said, which in many instances can be used with butane. In cold weather, he pointed out, a mixture containing as much as 50 per cent propane generally can be used satisfactorily. In warm weather lesser percentages must be used unless special engine adaptations are made.

A committee was appointed by the president of the association to confer with Pew in a study of the

Presidents of the contractors association: Howard P. Holmes, Two States Drilling Co., Tyler, Tex., newly elected; A. H. Rowan, Rowan Drilling Co., Fort Worth, third and retiring president; N. H. Wheless, Wheless Drilling Co., Shreveport, second president, and J. E. Brantly, Drilling & Exploration Co., Inc., Dallas, first president

Group of newly elected vice presidents of the contractors association: J. E. Warren, Carl B. King Drilling Co.; William T. Payne, Big Chief Drilling Co., Oklahoma City; H. E. Hamilton, Morris & Hamilton, Houston; Ralph Marshall, Drilling & Exploration Co., Inc., Los Angeles, and K. B. Knox, Petroleum Well Servicing Co., Houston

situation relative to steps to be taken to solve the problem.

Claude Parsons, director of materials, PAW, reported on the availability status of many critical items of equipment and materials. He stated that every effort is being made to direct more raw materials to manufacturers of oil-field equipment and to assist individual drilling and operating companies in obtaining essential items from various sources. He warned, however, that although the situation in respect to some items continues to improve that individual difficulties in obtaining materials will arise and that the number of problems will increase as the number of rigs in operation become greater. The unprecedented domestic drilling program getting under way, coupled with increasing foreign demand, will serve to amplify the critical shortage of many items, he said. Manufacturers were urged to appraise the trend in drilling, and contractors to anticipate requirements for equipment and materials at least a year in advance, if possible.

Principles of accounting practices for drilling contractors were outlined by Wallace W. March, Drilling & Exploration Co., Inc., Dallas. J. Doyle Settle, assistant executive secretary of the association, gave a report on the outlook for transportation equipment, and Glenn A. Campbell, chief of materials section, PAW, discussed prospects of getting additional manpower.

Resolutions placing the association on record against ratification by the Senate of the proposed Anglo-American oil agreement were passed unanimously by the association. New projects authorized by the board of directors to be undertaken by the association include a study of the housing problem in congested areas, a safety program and formulation of a standard of safety practices, and the development of a standard form of accounts.

ABSTRACTS

of the principal papers presented before the annual meeting of the American Association of Oilwell Drilling Contractors

Results of Continuity Of Operations

WARREN S. CHURCHILL, Arrow Drilling Co., Tulsa.

CONTINUITY of operations under normal conditions means uninterrupted employment of equipment, and is the condition most desired by every drilling contractor. It results in increased profits. Lack of reasonable continuity of operations has caused financial failures.

Operators can contribute to continuity by assignment of new locations prior to completion of a well. This permits advance installation of all preliminary requirements at the new location and cuts loss of time in moves. Operators benefit by having developed to their account through the contractor a saving in drilling costs of as much as 15 per cent.

Contractors are aided in continuity when they receive the benefits of experienced and efficient labor, have available the highest quality equipment and materials for their requirements, obtain immediate services of established truck, rig building and dirt contractors, and have the efficient, effective cooperation of the numerous service companies.

Average number of wells drilled per year for the period from 1938 to 1941, inclusive, was 26,625 wells. Average footage per year for the same period was 89,500,000 ft., and the average number of rigs operating was 1,162. The record for the years since the war opened follows:

Year	No. wells	Footage	Rigs operating
1942	18,500	63,000,000	1,000
1943	17,500	57,000,000	1,148
1944*	23,500	75,000,000	1,510

*Estimated; figures based on record for first 6 months.

Since the high average maintained through the period prior to the war did not demand continuity of operations only for a small percentage of the known available equipment, it was logical to believe increased development work could be cared for by equipment available and in the hands of competent contractors, provided it could be maintained in repair and replacements, competently manned and in continuous operation.

The war emergency record up to the second quarter of 1944 (above tabulation) during which period the number of wells and the total footage drilled per year was somewhat less than the average for the 4-year period before the war, indicates continuity was not demanded. During 1942 more than 100 rigs were stacked. With no greater demand in sight, equipment was permitted to deteriorate and working stocks for repairs and replacements were depleted and experienced labor left.

During late 1943 and 1944 demands for drilling stepped up rapidly and by the second quarter of 1944 every workable rig was in operation. Efforts were made to reestablish stacked equipment and manufacturers were permitted to make new equipment. This resulted in increase of 362 rigs for 1944 over 1943. Many of these are composed of surplus and obsolete equipment, to which have been added a large per cent of new equipment and material. It is believed the comparatively small amount of footage indicated for 1944 could be drilled more economically and effectively had materials and labor as required to establish and operate additional equipment been directed to maintenance and manning of the equipment as was available at the beginning of the emergency. Greater continuity would be possible with increased footage and economy. Field requirements now are about the same as during the prewar period.

Attempts to meet drilling demands by increasing rig footage through uninterrupted operations are meeting some success, but some problems have developed which are beyond the industry's power of early correction and adjustment. Chief of these are: (1) Trucking facilities are greatly reduced; (2) operators, except in active pools, are not giving new-well assignments far enough in advance, and (3) housing and general living conditions delay progress of specific jobs.

Rotary Drilling Equipment

JOHN A. CHAPMAN, Grey-Wolf Drilling Co., Houston.

ONE of the main objectives in the design and manufacture of new drilling equipment is to decrease its weight and at the same time maintain and increase its capacity. Greatly increased production of lighter metals, now directed to war needs, which can be alloyed to strength suitable for oil-field requirements, will help to attain these objectives.

Power rig manufacturers have demonstrated that speed changes for draw works or hoists can be made in oil-bath housing on short centers. This eliminates the need for jack and line shafts. Although it will be necessary to have a cathead shaft, this need not be any larger than required for the actual power util-

(Continued on page 108)

Key Oil Men See Sharp Rise in Postwar Use of Airplane

by T. F. Smiley

AMONG winged ships that will ride the skies in future time many will be oil-owned, for the airplane is to fill a strikingly widened place in postwar operations of the petroleum industry. This is clearly revealed in communications received by The Oil and Gas Journal from key men and in personal discussions of plans.

Replies to specific questions submitted to a representative group of oil producers and refiners, pipe-line men, drilling contractors, service organizations and equipment houses provide conclusive evidence of the important part air transportation is taking in their plans.

Questionnaires filled out by 32 companies and independent operators in the oil or allied industries show that only 8 have airplanes now. Significant of the value which the 8 attach to this mode of travel is the fact that every one of them is planning to buy one of more additional planes upon cessation of the war. Furthermore, among the 24 who do not own planes now, 20 or 83 per cent, will get them as soon as possible after the advent of peace. Others who have not reached a definite decision say they ultimately may be in the market.

One of the present owners of planes has two 5-seaters, one 7-seater and one 4-seater. These cost from $20,000 to $61,000. This company will need replacement ships, if not additional ones, as time passes. Another owner has three 4-passenger planes, each purchased at a cost of $10,000. The 20 prospective buyers will get planes seating 4 to 8 passengers. The 6-passenger type appears to be the favorite. All except one want the 2-motor.

Cost of the ships to be bought (one company intends to buy two) ranges from $5,000 to $100,000, the latter figure evidently meant to represent a plane of pronouncedly modern design and appointment. The lower-cost planes will be 4 and 5-seaters for relatively short trips, with ready serviceability the chief desideratum.

Eighteen of the prospective buyers say their new planes will be primarily for the use of executives; but heads of departments, field men, geologists, engineers, construction superintendents, etc., are also named in most cases as among those who will be frequent passengers.

One company which has planes for use of its executives and key men has built several landing fields. "These landing fields," said a spokesman for the company, "make the use of the airplane a great convenience in keeping up with our field operations. I think that sort of thing will increase in the future. We are considering increasing the use of the airplane in the postwar period, employing small planes in geologic and pipe-line work. With operations scattered, a plane is a great time-saver. We would rely on commercial planes for travel along established routes for long distances, particularly outside of our operating areas."

One company said it would need two types of planes—a 2-engine type, with accommodations for at least six passengers, to be used by executives, and smaller planes to take men and materials to and from operations. For these smaller planes the company expects to build its own landing fields. Other companies commented approvingly on this plan, its usefulness in production and pipe-line departments being pointed out particularly. It was regarded as of value too in cases where commercial lines are not adequate and where light materials must be transported with minimum loss of time.

Commercial air lines will benefit in a marked degree from the oil industry's broader use of aviation. Of the 20 who will buy planes 9 say they will make much more use of commercial airlines also, and 6 will make slightly more use of them. Of the 12 who have not planned definitely to buy planes 2 say they will make much more, and 3 slightly more, use of commercial lines.

Inquiry among 65 key men in the oil or associated businesses (apart from the group of 30 already referred to as having replied to questionnaires) elicited the information that 44 of the companies which they represented never had owned a plane, but 48 gave it as their opinion that company-owned planes would save valuable time of executives and engineers and would be of important emergency use in case of breakdowns, disaster, etc. Eleven of their executives had owned private planes. Among the 65 those who indicated it was the intention of their companies to acquire planes after the war, $10,000 to $15,000 was named as the expected cost of such craft.

Aviation-Gasoline Capacity Adequate

WASHINGTON. — Production of 100-octane aviation gasoline by the United Nations during October will exceed requirements for combat and training purposes making possible for the first time accumulation of sorely needed working stocks and permitting the industry to proceed with the production of improved superaviation fuel.

Heretofore, the round - the - clock activities of the air forces in Europe and the extended operations in other theaters of war required such huge quantities of 100-octane fuel that the limited number of Allied refineries had great difficulty in meeting both combat and training requirements.

"We have more than 65 refineries producing finished 100-octane gasoline," reported Petroleum Administrator Ickes. "We are rapidly approaching our target. In October we will make enough 100-octane gasoline to meet all needs—at home and abroad, commence inventory accumulation, and at the same time improve quality."

Commenting upon the 100-octane program, Deputy Petroleum Administrator Raloh K. Davies said that in all some 450 refineries and natural gasoline plants are now engaged in making petroleum war products including 100-octane and its components.

In announcing the achievement in 100-octane aviation gasoline production, Davies added:

"This does not mean that production can be permitted to slacken. Aviation gasoline is produced by chemically synthesizing superingredients in highly specialized equipment, by isolating the highest octane ingredients available in petroleum, and by mixing these special ingredients with gasoline. The more ingredients and the less gasoline in the blend, the better the fuel. The B-29s, the B-32s, the carrier fighters, and the newer airplane engines generally need still better fuel. We are determined to give it to them. This means that we must force additional production of superingredients and less gasoline in the blend. This in turn means that all of the plants must run top speed to make a lesser quantity of a better fuel.

"Hitherto, the only superfuels we have been able to manufacture have been small quantities for use by engine manufacturers and for laboratory experiments."

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

After V-E Day

WASHINGTON.—The total demand for petroleum products after victory in Europe will require domestic field, refining, and transportation operations at approximately present levels. There may be a downward adjustment period of a few weeks while the Allied war program is being concentrated in the Pacific theater, but when that is accomplished new military demands and the liberalization of civilian rationing among the United Nations will largely offset any reduction in military requirements resulting from Germany's capitulation.

The foregoing appears to be an adequate summary of opinions here of those familiar with what has been done in petroleum operations since Pearl Harbor and who have responsibilities regarding plans for the future. There are "ifs" in all projections, but plans of the military are to be on the safe side in regard to future supplies, and any downward revisions will be made later, as justified.

Aviation-fuel requirements will be the yardstick for determination of operating trends of the entire industry until the war ends on all fronts.

Looking to the near future, it should be pointed out that there are those, possibly influenced by political expediencies and recent predictions of Allied leaders, who insist that several months of 1945 will elapse before V-E day. If that view proves correct, there will be no leveling off in total demands, but every petroleum facility of the United Nations, now operating near capacity, will be called upon for maximum production with little or no relaxation in civilian restrictions.

Refiners will be the principal buffer in the adjustments of V-E day when it comes. Greater yields of superfuels for aviation use will be required as the all-out war shifts to the Pacific. As one ranking officer has said, development of these new fuels by the oil industry's refiners, greatly increasing the military effectiveness of aviation, will simplify and shorten the conquest of the Pacific with its long distances between strategic bases.

This additional emphasis on aviation-fuel quality poses new plant problems for the refiner, coming at a time when he might seem entitled to a breathing spell after 2½ years of solving war-production problems. There will be byproducts from the superfuel operations which must be made to conform to civilian-grade motor fuels. With heavy civilian and military storage at this time, residual fuels may represent a special problem after V-E day.

It appears there will be an additional 250,000 bbl. or more of gasoline that can be utilized daily in civilian consumption in the United States with other quantities which should be used to relieve civilian shortages in Allied countries. Consumers should be able to have more furnace oil. No misconceived program of war agencies involving conservation of tires and cars should be permitted to hold back gasoline supplies from civilians when they become available. To do so would not help the war effort or the postwar adjustment in any particular.

The principal conclusion from this brief summary of the near-term outlook from the nation's and the world's oil capital is that the time has not arrived for any letdown in the petroleum industry's complete support of the war program. New war machinery and methods and the expansion of existing facilities will continue to stress the essentiality of petroleum until final victory arrives.

$352,000,000 Refinery Construction Program Outlined

WASHINGTON. — United States petroleum interests plan to spend more than $352,000,000 on domestic and foreign refining facilities as soon as materials become available, it was revealed last week by Ralph K. Davies, deputy petroleum administrator.

At the same time, Davies disclosed that he had sent a letter covering the contemplated construction to the War Production Board. Attached to the letter, which is based on information received by PAW in response to a request for information sent to petroleum operators were two tables containing:

1. $176,789,385 in domestic refinery construction.
2. $176,155,000 in foreign construction excluding any estimate for the rebuilding or rehabilitation of facilities in areas now occupied by the enemy.

In his letter, Davies pointed out that oil refinery operations have been increased by some 800,000 bbl. of crude oil daily. This increase has been accomplished with a minimum of new construction and that much of the overload was handled by prewar facilities. Equipment has been wearing out at an accelerated rate and the replacement of worn and inefficient equipment is an immediate problem.

Additional Materials Probable

Further, it was pointed out that WPB's announced plan for relaxation of material controls will presumably make available additional steel for pipes and raw materials for the fabrication of "a thousand and one items for production of crude oil and natural gas." Similarly, when controls are relaxed materials and parts will become available for necessary improvements in distributing facilities.

However, in the field of refining the problem is a different one, requiring additional action, Davies said.

Terming refinery construction as "slow and costly," Davies drew attention to WPB procedure on "construction projects," which will have to be approved as such, even after victory in Europe.

Davies pointed out that no commitments were made that permission to proceed would be given, it was emphasized that first consideration would probably be given to those projects that lent themselves more directly to the support of the present petroleum war program.

The first letter was followed by another on August 10, 1944, which pointed out that consideration would be given to the order in which the proposed projects were received and again emphasized that the information requested was not to be taken as authority to proceed nor was it to be considered as an official notice that materials were "easy."

Backlog of New Facilities

The replies to the refinery survey indicated that there was a tremendous backlog of new facilities, falling into three general classifications:

1. New facilities to replace equipment that has been subject to excessive depreciation because it has been operated at high rates and severe conditions during the war.
2. New facilities required because of obsolescence resulting from the rapid progress in refinery technology during the war.
3. New facilities to permit greater yields of desirable highly refined products from a given volume of crude oil processed and to make possible the use of what are now considered less desirable crudes to achieve this end.

TABLE 1—DOMESTIC PROJECTS BY TYPE

Catalytic cracking	$90,775,000
Lubes	42,869,928
Greases	3,524,170
Waxes	2,627,900
Crude topping, thermal cracking and coking	10,612,875
Solvents and specialties	2,075,000
Alkylation, isomerization and polymerization	7,348,000
Asphalt	1,765,000
Sulfuric acid	1,570,000
Treating	500,000
Utilities, services, etc.	9,272,412
Research and development	3,850,000
Total domestic	$176,789,385

TABLE 2—FOREIGN PROJECTS

Five new refineries	$146,000,000
Additional facilities	30,155,000
Total foreign	$176,155,000
Grand total, Tables 1 and 2	$352,944,385

Diesel Power High in Postwar Outlook, Automotive Leader Says

OKLAHOMA CITY.—It is probable that old refining equipment will be written off and the new war-built equipment will be used to produce the engine fuels of the postwar period, White Motor Co.'s chief engineer Robert Cass told the Mid-Continent Section of the Society of Automotive Engineers here October 6. The postwar prospect includes both gasoline and diesel fuels and engines, to power the varied jobs which are waiting for peace to come, he said, and each will have its place.

Our best diesel fuels will probably be used in modern catalytic cracking processes, Cass stated; "This will mean doctoring the fuel with chemical additives to improve the ignition point, and we may still have an accentuated problem of engine deposits caused by the change in refining processes." In the four to five-year period following world peace it may well be that we shall reach an octane number of 90-95 in premium motor fuels. It is also quite possible that, because of the higher efficiency and the availability of large amounts of products of high octane number the higher powered engines of the future may be designed entirely for the premium grade of fuels, Cass believes.

Two of the main principles for improving the gasoline engine are supercharging, which is coming so strongly into aviation-engine operation, and solid injection of gasoline-type fuels, Cass pointed out. Octane number requirement for solid injection is said to be lower than for a carburetted engine fuel, but solid injection of gasoline is in its infancy for truck engines. First cost and maintenance costs for injection systems for gasoline engines will be analogous to those for diesel engines, therefore the fuel savings must be appreciable, say of the order of 15 per cent, to make the solid injection system attractive, the speaker said.

The remarkable development of aviation air-cooled engines showing an approach to "a horsepower per cubic inch" (piston displacement) points the way that heavy-duty engine may trend in development. Bearing loads will be increased in future, Cass indicated; copper-lead bearings which have a manufacturers' rating of a load of 3,000 p.s.i. are now run at 1,200-lb. loads, he stated; postwar designers plan to make these bearings to operate at 2,000-2,200 p.s.i., with the same margin of operating safety. Babbitt bearings for trucks are "gone," the speaker said, with copper-lead needing some improvement.

Present Patent System Defended At Industrial Research Forum

by N. O. Fanning

NEW YORK. — Retention of the present patent system and close collaboration between research activities of industry, educational institutions and the federal Government were urged by speakers at the forum on "The Future of Industrial Research" held last week at the Waldorf Astoria. The forum, sponsored by Standard Oil Development Co., research subsidiary of Standard Oil Co. (New Jersey) on the occasion of its twenty-fifth anniversary, brought together leaders in research in all branches of industry and government.

Eugene Holman, president of the Jersey Standard company, led the dinner session, Frank A. Howard, retiring president of the development company and vice president of Standard of New Jersey, was toastmaster.

Among principal guest speakers at the evening session was Undersecretary of War Robert P. Patterson, who recommended formation of a single unified defense agency, combining the Army and Navy, to facilitate research activities by the establishment of a corps of scientifically trained officers as an integral part of the service.

Howard stressed the need for a middle course in the handling of the patent problem and said the attitude of the "trust busters" in seeking to break down the patent system was extreme, notwithstanding some defects in the system undoubtedly did exist.

The present patent system was stoutly defended by Thomas Midgley, Jr., president of American Chemical Society, at one of the regular sessions of the forum. "I am proud of our patent system," he declared. "There will be attacks made on it in the future, as there have been in the past, probably by individuals who have little knowledge of their subject. It would seem that a comprehensive discussion of the exact situation at the time would be all that is needed to retain the merits of our present system.

"I am of the opinion that, as time goes on, more and more research of the fundamental type will be necessary. Should such research be done in the actual industrial laboratory or would it be better, in most instances, to delegate it to the educational institutions? Admittedly, some special cases will occur wherein the fundamental knowledge will be needed so quickly that the higher tempo of the industrial laboratory, for obtaining results, will be indicated and other cases will occur where the need for secrecy is so great that it cannot be entrusted elsewhere. However, the majority of cases should be such that they may be safely entrusted to the research staffs of our universities and colleges for study."

Research to Expand

Dr. Frank B. Jewett, retiring vice president of the American Telephone & Telegraph Co. in charge of development and research and former chairman of Bell Telephone Laboratories, predicted the growth of industrial research organizations both in number and in size and diversity of fields.

"They do not need to be large to be efficient," he pointed out, "and in a host of industries concerned with specialized products we will find small laboratories doing distinguished creative work. In many fields, however, the products will be such as to involve a wide range of physical, chemical and biological problems so interwoven as to call for scientific attack from many angles, and so we will have large research organizations with specialists and specialized facilities in many fields, all organized to function as a coordinated team.

"Experience has shown that this is the most powerful, effective and economical method of handling complex problems. It is greatly superior to any scheme of farming out portions of the problem to individual laboratories.

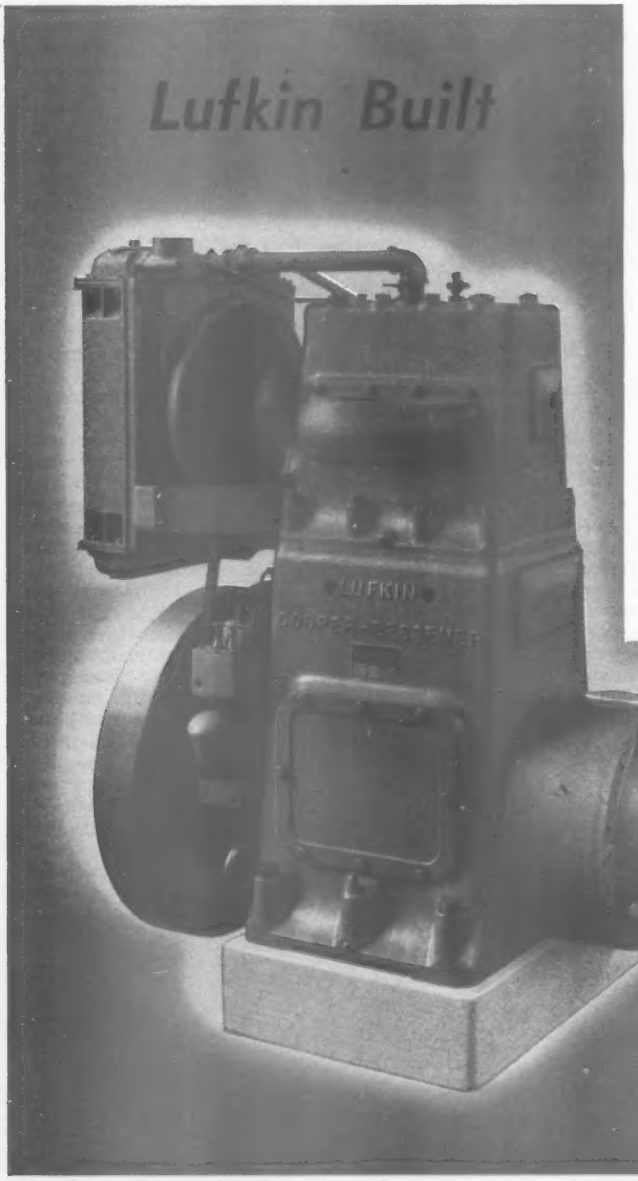
"I do not mean to imply that there is no place for specialized industrial research laboratories nor that great research organizations will not find it profitable to seek their assistance. In general I think, however, that such assistance will be confined to questions which are in themselves essentially complete problems.

"The great objection to delegating to political government control of much of industrial research and development is inherent in the structure of government itself. Government is necessarily political, i.e., motivated by the resultant of many forces which must often be compromised if anything is to be accomplished. In such circumstances it is difficult, if not impossible, to insure against the intrusion of political factors which are inimical to the full realization of all that fundamental and applied science is capable of doing. In addition to this, government must necessarily be controlled, if it is to operate at all effectively, by general and rather rigid rules many of which we are commonly wont to describe as red tape and which must be applied impartially over a wide variety of activities.

"Thus, quite aside from the pernicious intrusion of political factors which have no place in a research undertaking, the setting is one in which a large number of the best of our scientific and technical men are reluctant to operate. As a result, there is a large tendency toward the expenditure of huge sums of money for what is essentially second-rate work done by those less-than-best men who are content to spend their

Under-Secretary of War Robert P. Patterson addressing the industrial research forum. Listening are: Rear Admiral J. A. Furer, Navy Department; Eugene Holman, president, Standard Oil Co. (New Jersey), and H. C. Wiess, president, Humble Oil & Refining Co.

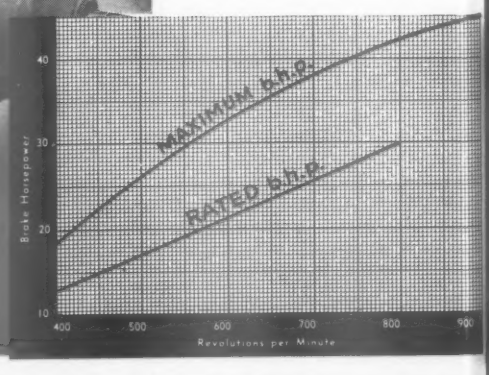
G-SC and G-SD engines



Despite prior commitments and peak Diesel production for the armed forces, Cooper-Bessemer can deliver these two pumping engines promptly from warehouse stock, because both engines are now being built by Lufkin Foundry and Machine Co., at Lufkin, Texas.

The dependability of these engines is proved by performance totaling many millions of service hours. Hundreds of units of each type have been in continuous use for as much as seven years.

As these photographs indicate, the G-SC, rated 25 to 35 horsepower, and the G-SD, 40 to 60 horsepower, are



CURVE A—Maximum Brake Horsepower Developed by type G-SC gas engine. CURVE B—Recommended rating for continuous full load operation with radiator and air filter.

DIESEL AND GAS ENGINES

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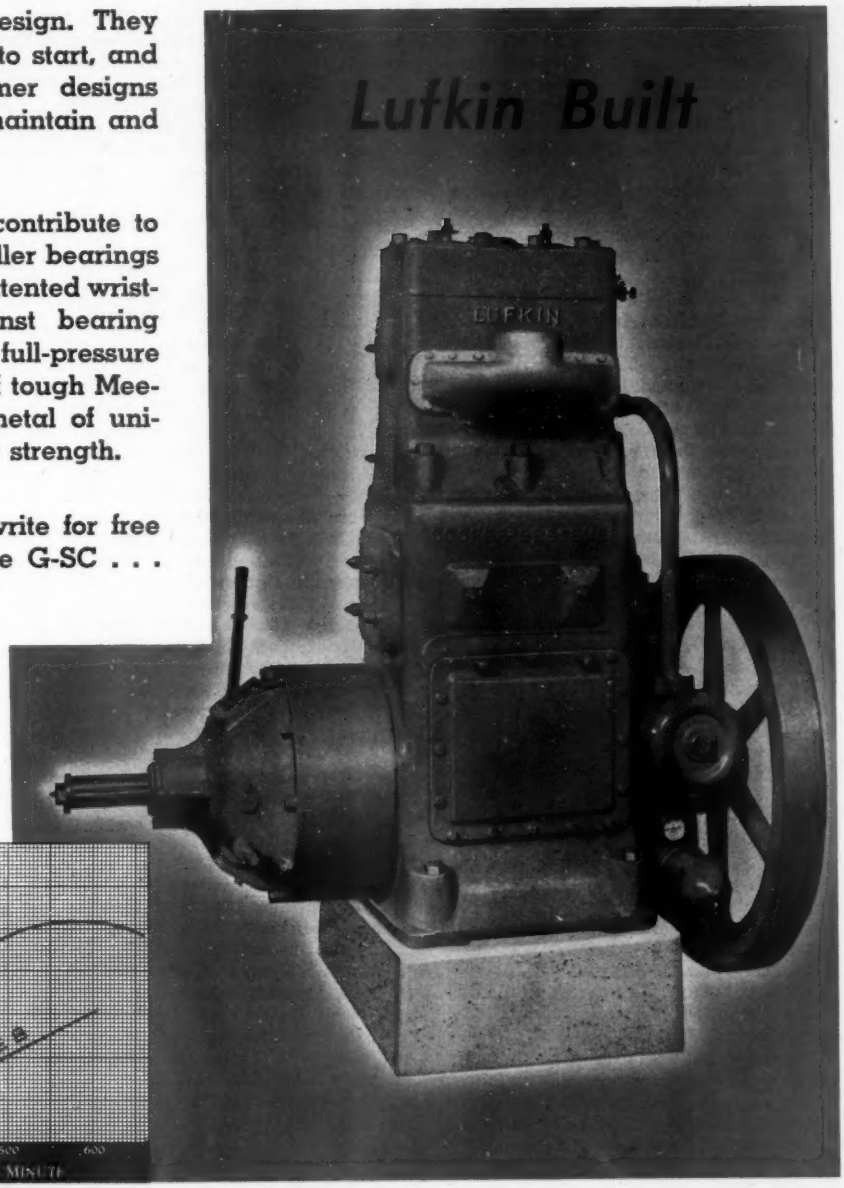
ompact and simple in design. They re light in weight, easy to start, and ke other Cooper-Bessemer designs ney are economical to maintain and perate.

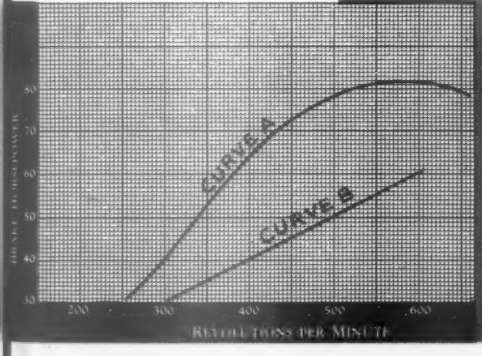
Certain special features contribute to heir long life. Tapered roller bearings nd Cooper-Bessemer's patented wrist-in design protect against bearing ilure. Lubrication is full-pressure ype. All cast parts are of tough Mee-anite, a close-grained metal of uni-orm quality and unusual strength.

For further information, write for free ulletins — No. 326 for the G-SC . . . o. 303 for the G-SD.



URVE A — Maximum Brake orsepower developed by 7½" x type G-SD gas engine in ctual test.

URVE B — Recommended Rating r full load operation.



by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

ouston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

lives as poorly compensated civil servants."

Other speakers at the various sessions and subjects covered were:

Charles F. Kettering, general manager research laboratories of General Motors Corp., who acted as general chairman of the morning forum.

Harry L. Derby, president American Cyanamid & Chemical Corp., "The View of Industrial Management Toward Research."

Warren K. Lewis, professor of chemical engineering, Massachusetts Institute of Technology, chairman of the afternoon forum.

Edwin H. Land, president Polaroid Corp., "Research by the Business Itself."

Dr. Westbrook Steele, executive director Institute of Paper Chemistry, Lawrence College, "Research by Trade Associations and Cooperative Groups."

Dr. Earl P. Stevenson, president Arthur D. Little, Inc., "Professional Research Organizations."

Dr. Clyde E. Williams, director Battelle Memorial Institute, "Research by Foundations."

A. C. Fieldner, chief of Fuels and Explosives Branch, U. S. Bureau of Mines, "Research by Government."

Other guests present at the dinner session of the forum included Rear Adm. J. A. Furer, who addressed the meeting briefly; Dr. Robert E. Wilson, president, Pan American Petroleum & Transport Co.; H. C. Wiess, president, Humble Oil & Refining Co.; Dr. Mervin J. Kelly, Bell Telephone Laboratories, and R. G. A. Van der Woude, president of the Shell Union Oil Corp.

New Office Established for Synthetic Liquid Fuels

WASHINGTON. — The Office of Synthetic Liquid Fuels, to supervise a 5-year program of research and development designed to provide oil and gasoline from sources other than natural petroleum, was established last week by Dr. R. R. Sayers, bureau director. The action has the approval of Petroleum Administrator Harold L. Ickes.

Authorized recently by Congress, the synthetic-fuels program includes construction and operation of laboratories and demonstration plants to promote private commercial production of synthetic liquid fuels from coal, lignite, oil shales, and agricultural and forestry products. There will be four divisions: research and development, synthesis gas production, hydrogenation demonstration plant, and gas synthesis demonstration plant. In addition, an oil-shale section has been set up within the bureau's petroleum and natural-gas division.

Dr. W. C. Schroeder has been appointed acting chief of the new office, which will operate under the fuels and explosives branch, headed by Dr. A. C. Fieldner, branch chief. He has been assistant chief of the fuels and explosives branch for the past 2 years.

With an initial appropriation of $5,000,000, the synthetic-fuels program calls for three demonstration plants, one for the extraction of oil from shale; another using the direct hydrogenation process of converting coal, lignite, agricultural and other products to liquid fuels, and a third utilizing the gas-synthesis process for the same purpose. Research and development laboratories are planned to provide the facilities to study and improve each of these methods of synthetic-fuel production.

Standard Denied Injunction But Gets Protection Sought

NEW YORK.—Although denying application by Standard Oil Co. (New Jersey) for a preliminary injunction against the alien property custodian, relative to his licensing of certain seized patents, a court order signed by Federal Judge John C. Knox expressly provides that upon showing of damage or threatened damage to its interests by reason of an action on the part of the custodian, Standard may apply to the court for relief.

This order affirms the decision of Judge Knox, handed down September 5, 1944, in which he called attention to the custodian's statement that the custodian's normal licensing policy (of granting royalty-free licenses) will not be followed in connection with these patents, and that he will do nothing with the patents which the plaintiffs themselves are not bound to do.

Suit for recovery of the patents is still pending in the federal court. In the interim, however, the alien property custodian had offered the seized patents on his normal licensing basis, which Standard of New Jersey maintained would amount to confiscation of their value. To forestall this threatened dissipation, the company asked for a temporary injunction to restrain the custodian from carrying out his announced policy.

PAW Revokes West Coast Fuel-Oil Directive

WASHINGTON. — Petroleum directive 71 has been revoked by Petroleum Administration for War, following the action of the Navy in shifting its supply requirements for 7-0-2 diesel oil from the West Coast to other areas to permit West Coast refiners to increase the production of more urgently needed Navy Special fuel oil. The directive affected West Coast refiners only and was originally issued to restrict for military use certain fuel oils required in the manufacture of the 7-0-2 Navy diesel oil.

Revocation of the directive is in line with PAW policy of removing all restrictions as soon as they are no longer necessary to meet wartime requirements.

Permian Oil Properties Acquired by Stanolind

Capital stock and physical properties of Permian Oil Co. have been acquired by Stanolind Oil & Gas Co. The properties include 53 producing oil wells in the Slaughter pool of West Texas, with an allowable daily production of approximately 3,000 bbl. and some undrilled acreage. Stanolind Pipe Line Co. has a 12-in. crude oil pipe line from the Slaughter pool to Drumright and Cushing and is handling around 70,000 bbl. of West Texas crude through that line daily. The consideration involved in the purchase was not given out.

Magnolia Posts New Crude Prices for Oklahoma

DALLAS. — Magnolia Petroleum Co. has posted the following prices for crude oil bought in Oklahoma, exclusive of the Cement field, in Caddo County, and the Oklahoma City field: Below 20° gravity, 83 cents, with 2-cent differential beginning with 85 cents for 20° to 20.9° gravity to a top of $1.25 for 40° gravity and above. In cement and Oklahoma City pools, 16° to 16.9° gravity, 73 cents, with 3-cent differential to a top of 85 cents for 20° to 20.9° gravity; 21° to 21.9° gravity, 87 cents, with 2-cent differential to a top of $1.25 for 40° gravity and above.

DEATHS

Leon M. Anderson, Sr., 60, drafting engineer for Gulf Oil Corp., died September 30 in Houston.

W. Frank Alexander, 66, Mannington, W. Va., superintendent of Eureka Pipe Line Co., died September 25.

Paul F. Johnson, 38, safety engineer for Ethyl Corp. for 15 years, died October 3, at Omaha, Neb.

Lewis Gray, 84, retired independent oil operator, died October 8 in Tulsa. He and his brother, the late George Gray, operated under the name of Gray Brothers.

Modern Methods of Reconditioning Large-Diameter Pipe

by R. W. Todd and A. B. Polley

DURING the past 3 months Pacific Lighting Corp. reconditioned a portion of its 26-in. Kettleman Hills-Wilmington pipe line. The present manpower shortage, along with the scarcity of material and the size of the job, necessitated more extensive use of mechanical equipment than has been the practice in the past in the reconditioning of pipe lines of this size.

The section of line reconditioned was in the vicinity of McKittrick, and was originally installed in 1931. The pipe was double-belled end, 26-in. o.d. with ¼-in. wall, weighing 68.75 lb. per lineal foot and contained a longitudinal weld, the bead of which was scarfed leaving a sharp shoulder ¼ in. wide and raised ⅛ in. above the parent metal.

The pipe reconditioned was originally installed with a protective coating consisting of cold primer, a hot coat of asphalt, and a single wrap of asbestos wrapper. Long line currents and very low-resistance soils in this area combined to produce a severe electrolytic action with resultant pitting of the pipe. The first leaks from this electrolysis occurred in 1940, and continued to increase each year. Cathodic stations were installed to eliminate the electrolysis condition, and while these stations arrested further electrolytic action, the pipe had deteriorated to such an extent that pits continued to break through and leaks continued to occur. The protective coating had also deteriorated and did not provide adequate insulation for the cathodic protection so that the effective limits of each station continued to decrease, and it was not economical to continue to install intermediate cathodic-protection stations.

Inspection holes dug along the section of line to be reconditioned and leaks which had occurred indi-

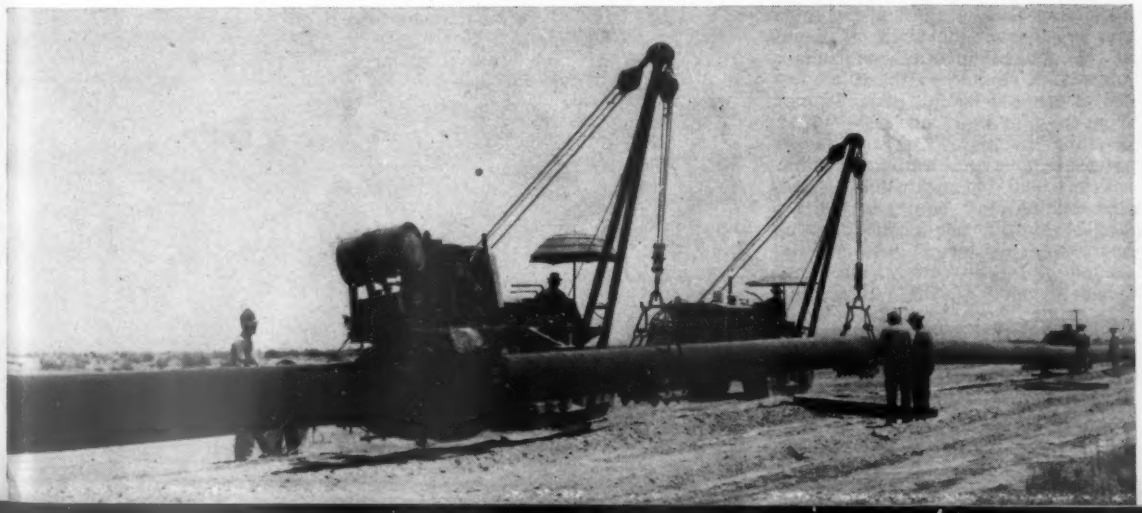
RAYMOND W. TODD *ALLISON B. POLLEY*

Following graduation from Stanford University in 1936, Raymond W. Todd went to work for Industrial Fuel Supply Co. as field engineer in southern division. He is now general field engineer in charge of field engineering, construction, and maintenance of the varicus pipe-line facilities of Pacific Lighting Corp.

Also a graduate of Stanford, in 1932, Allison B. Polley, coauthor with Todd, is field engineer in the northern division for Pacific Lighting Corp., having charge of construction and maintenance along the 26-in. pipe line extending from Kettleman Hills to Los Angeles. Prior to his association with his present company, he worked for Industrial Fuel Supply Co., which later consolidated with Pacific Lighting Corp.

This article was presented as a paper at the fall meeting of the Pacific Coast Gas Association.

Selfpropelled, traveling pipe-cleaning machine with single rotating head, equipped with spring-loaded, knife-like cutters operating on 26-in. Kettleman Hills-Wilmington pipe line



cated that the pipe had deteriorated to such an extent that portions would have to be replaced and the balance spotwelded. Inasmuch as the amount of pipe replacement and spotwelding to be performed could not be determined prior to the excavation of the pipe, it was impossible to obtain a firm bid for the performance of this work. Rather than to perform the entire job on a cost-plus basis, the work was contracted on a unit price for all work other than welding, spotwelding, and pipe replacement. The cost of welding, spotwelding, and replacement of sections of pipe which were too poor to be reconditioned was performed on a cost-plus basis.

Coating and wrapping 26-in. Kettleman Hills-Wilmington pipe line showing traveling machine on line with portable heating kettle at the left

The reconditioning work on the 26-in. line was started the latter part of May of this year. The ground along the route of the pipe line is reasonably flat so that it did not require preliminary right-of-way work. Stripping of the pipe was performed by the conventional ditching machine, which excavated to within 6 in. of the top of the pipe. Following the excavation, the pipe was lifted from the ditch by means of two caterpillar tractor sidebooms and set on skids over the ditch.

The original coating was stripped from the pipe by means of a W.K.M. cleaning machine. This unit is the conventional-type cleaning machine, selfpropelled by means of a gasoline engine and equipped with a single rotating head. The rotating head was equipped with spring-loaded knife-like cutters, which efficiently removed the old coating. The knives were found to be more efficient in the removal of the old wrapper and paint than the gear-type cutters. The teeth in the gear-type cutters had a tendency to fill with old coating and lost their cutting ability within a short distance. The knife-like cutters would clean approximately 3,000 ft. of pipe before having to be replaced. The sharp edges of the longitudinal weld and the increased diameter at the bell ends were greatly responsible for the short life of the knives.

In order that the cleaning of the pipe could be one continuous operation, the pipe was not cut upon removal from the ditch. With average maximum daily temperatures ranging around 100° F., it was found that the efficiency of the cleaning machine was greatly increased if the cleaning operations were performed during the cool hours of the morning before the pipe became warm and the old asphalt soft.

The cleaning machine required a cleared area of 12 in. below the bottom of the pipe. The pipe, with the cleaning machine riding on it, was raised up clear of the ground and skids by an RD8 sideboom tractor equipped with a dolly cradle which traveled immediately behind the cleaning machine. A typical cleaning crew was made up of the following personnel:

One tractor operator, one cleaning-machine operator, one swamper, four laborers. The average length of pipe cleaned in an 8-hour shift was approximately 4,000 ft.

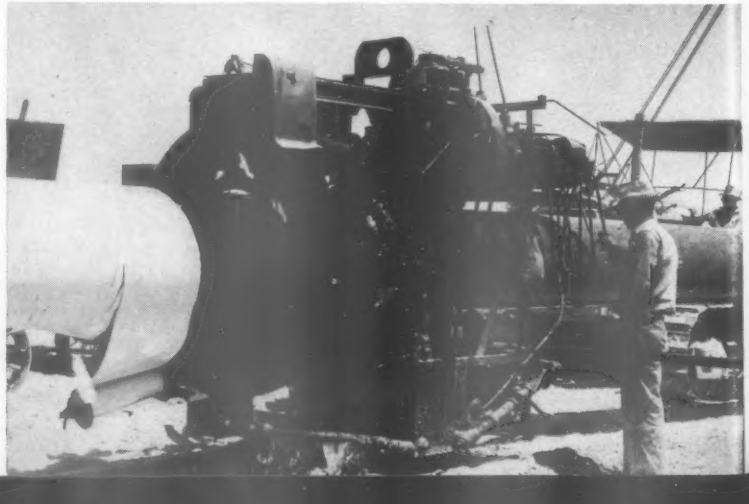
This type of cleaning removed practically all of the existing coating, but the knives would not cut the hard rust and scale which had formed on the outside of the pipe, nor did they clean out the pits in the pipe. In order to remove the hard rust and scale and to clean out all of the pits for spotwelding, it was necessary that the pipe be sandblasted. In order to facilitate the sandblasting and subsequent spotwelding operations, the pipe was cut into approximately 320-ft. sections after the old coating had been removed by the cleaning machine. In this way, the pipe could be rotated during the sandblasting and spotwelding operations and thereby eliminate overhead work.

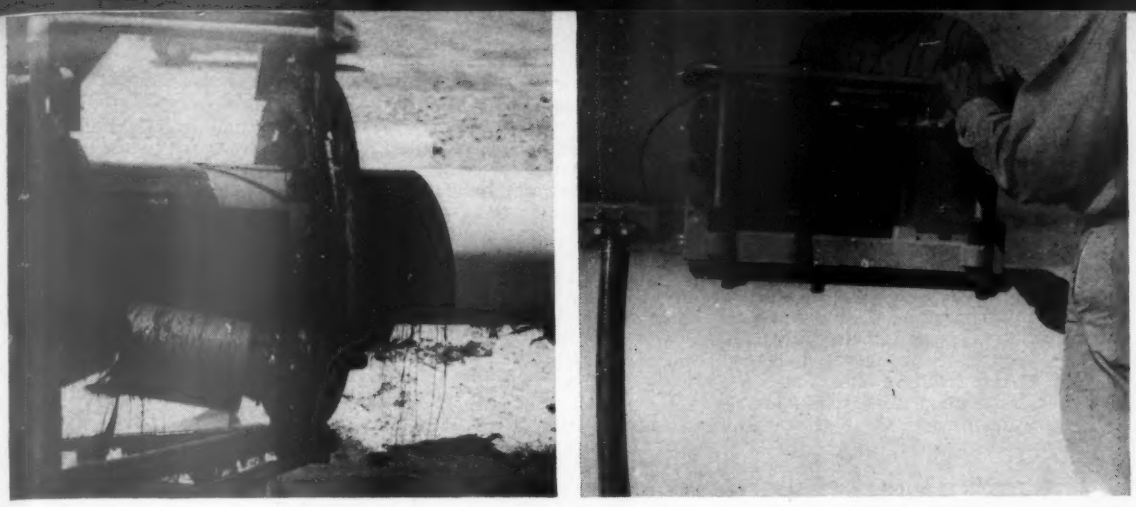
Sandblasting Procedure

Sand blasting was performed by four manually operated conventional sandblasting nozzles. Such a crew could sandblast approximately 2,000 lineal feet of pipe per 8-hour shift. The sand required for the blasting was obtained from a natural pit in the vicinity of the reconditioning work. The following equipment and labor were used in the sandblasting operations:

Two truck-mounted compressors, each with 350 c.f.m. capacity; four sandblasting units, one dump truck, one loader, one pickup, four sandblaster nozzlemen, four laborers, one compressor operator, two helpers, one truck driver, one foreman, one loader operator. An inspector followed the sandblasting opera-

Closeup of specially designed selfpropelled traveling coating-and-wrapping machine. At bottom is sump for return of excess coating material





Left: Rotating head at back of traveling coating-and-wrapping machine showing application of coal-tar-impregnated asbestos wrapper. Right: Electronic holiday detector passing along pipe following coating-and-wrapping machine

tions, marking the areas to be spotwelded and the sections to be replaced. In general, areas less than 4 in. in diameter and having 10 per cent or more metal loss were spotwelded. Sections having areas greater than 4 in. in diameter and a metal loss of more than 25 per cent were cut out and the pipe replaced.

The size of the spotwelding crews varied with the condition of the pipe, a sufficient crew being maintained to equal the progress of the sandblasting crew. The spotwelding performed on the job resulted in the average usage of 0.136 lb. of welding rod per lineal foot of pipe reconditioned. The replacement of the pipe which was judged too poor for reconditioning amounted to 13.5 per cent. After spotwelding and the replacement of the poor sections of the pipe, the 320-ft. sections were rewelded together and placed on skids along the side of the ditch. Sections of pipe 1 to 2 miles in length were then tested for leaks with air at 100 lb. pressure.

Following the satisfactory air test, the pipe was primed by means of a mechanical priming head attached to the cleaning machine. The knife cutters on the machine were replaced with steel brushes and the priming head installed in back of the head which carried these brushes. The rotating steel brushes removed all surface dust and dirt which had accumulated on the pipe after the sandblasting operations. The priming head was equipped so that the coal-tar primer was fed onto the top of the pipe and was then spread by two slings attached to the rotating head. Laborers with brushes followed the priming machine, catching all holidays and runs. The following equipment and labor made up the average priming crew:

One priming machine, one RD3 sideboom, one priming-machine operator, one priming-machine swamper, one sideboom operator, four laborers.

In view of the fact that the coal-tar primer had a bonding life of only approximately 48 hours, the priming was held to within 1 day's work of the treating crew. The priming equipment could coat approximately 6,000 ft. of pipe in 8 hours.

The protective coating for the pipe, with the exception of the primer, was applied by means of a single machine especially built for this job. The coating consisted of the following applied in the order named: One coat of coal-tar enamel, one wrap of coal-tar-impregnated asbestos wrapper, a second coat of coal-tar enamel, and a final wrap of manila paper.

The coal-tar enamel was composed of coal-tar pitch combined with micaceous inert mineral filler, and had the following physical characteristics:

Softening point, 200° F.; ash filler, 15 per cent; specific gravity, 1.40; weight per cubic foot, 86 lb.

High-Temperature Climate

The high softening-point enamel was selected because the coating was to be applied in an area where temperatures are in the vicinity of 100° F. or higher during the middle of the day. The use of this enamel eliminated all sagging and prevented damage to the protective coating during lowering-in operations.

The asbestos wrapper was 15-lb. coal-tar impregnated, and was used in 18-in. rolls containing 400 lineal feet.

The coating machine was selfpropelled by means of a gasoline engine. All of the protective coating was applied within a distance of 6 feet by the coating machine. An adjustable shoe, 12 in. wide mounted on the forepart of the machine and extending completely around the pipe, applied the first coat of enamel. All excess enamel was returned to a collection sump carried underneath and at the forward end of the machine. In back of the enamel shoe was a revolving head with an arm on the front side on which the roll of asbestos wrapper was placed. A brake on the arm carrying the asbestos wrapper allowed the tension on the wrapper to be adjusted to any required degree. A nozzle mounted directly behind this rotating head and extending over the upper third of the pipe distributed the second coat of enamel over the top half of the pipe containing the first wrapper. A shoe of belting material caught the enamel on the underside and spread it over the lower half of the wrapped pipe. A trough under the shoe caught all excess enamel and returned it to the sump. A revolving head, identical to the one carrying the roll of asbestos wrapper and 6 in. back from it, carried the arm which applied the wrap of manila paper. This arm was on the back side of the head. The gear ratio of the forward travel of the machine to the rotating speed of the two heads was constant and gave even spiral wraps with a lap of 1 in. Pumps mounted on the forward part of the machine and powered by the gasoline engine pumped the enamel out of the sump at the bottom of the machine and recirculated it in the machine along with the enamel coming from the heating kettles. This pump was also connected so that it could discharge the enamel back into the kettles whenever it was necessary to shut down the machine. Specifications called for the first coat of enamel to have a minimum thickness of 3/32 in. and the second coat a minimum thickness of 1/16 in. Actual usage in the treating of the pipe resulted in consumption of the following amounts of material per lineal foot of 26-in. pipe. These amounts do not include material used in repairing holidays or skid marks.

Coal-tar enamel, 12.85 lb.; 15-lb. asbestos wrap, 7.45 sq. ft.; coal-tar primer, 0.025 gal.; manila wrapper, 7.25 sq. ft.

Three factors controlled the thickness of the enamel applied on the pipe: First, the temperature of the enamel; second, the tension on the wrapper; and third, the adjustment on the spreader shoes.

The treating machine required a clearance of 30 in. net below the bottom of the pipe. Two RD8 sidebooms with cradles were used ahead of the treating machine on the flat portion of the job and three were used on the slightly rolling portion to provide the required clearance. The tar was supplied to the coating utes' operating time of the machine was required to empty a pot.

Any pots of enamel not used within a 2-hour period after the entire contents of the pot had reached a molten state were condemned and dumped. No reheating or addition of flux to the enamel was allowed. To eliminate any possibility of coking or carbonizing, the bottom of each pot was scraped clean after it had been emptied. All shovels, hoes, and rods used in connection with the stirring of the hot enamel or cleaning of the pots were equipped with metal handles in an effort to reduce the possibility of foreign particles entering into the molten enamel.

With 25 minutes' unloading time, 15 minutes' scraping and cleaning time, 25 minutes' spotting and charging time, and a heating time of 4 hours, approximately 5 hours were necessary for one complete cycle for each pot. A maximum of 14 pots of enamel were used in 1 day's operation. While these pots are rated as 10-bbl., the bulking of the cold enamel at the time of charging cut their capacity to approximately 8 bbl. The tar pots were spotted by an RD4 caterpillar.

Wastage from the treating machine was less than 5 per cent. Following treating, the pipe was allowed to rest on skids placed along the side of the ditch. These skids were spaced at alternate bell end welds. Due to their increased diameter, each bell end weld was found to have an insufficient thickness of coating and required patching. By placing the skids at these welds, one patch repaired both the thin coating on the bells and the skid mark.

The average progress of the treating operation was 3,300 ft. per 8-hour shift. The maximum of footage obtained in one 8-hour shift was 4,800 ft. The average treating crew was composed of the following equipment and labor:

Two to three sidebooms (RD8) with cradles, one RD4 caterpillar, one treating machine, 12 tar pots, two sleds, one pickup, two to three sideboom operators, one RD4 operator, 12 tar-pot operators, one tar-pot foreman, one treating-machine operator, one assistant treating-machine operator, one treating foreman, two swampers, one wrapping man, six dusters, four skid men, four laborers.

After the application of the coating and prior to the lowering and backfilling, an electronic holiday detector of 15,000-volt capacity was passed over the pipe in order to spot any holidays that might exist. This holiday detector consisted of one box, housing the vibrator unit, and one 6-volt storage battery. Both of these were carried on a carriage which rolled on rubber wheels along the top of the pipe. Attached to the carriage was a circular spring which passed completely around the pipe. The machine was grounded by a 25-ft. length of cable, which was dragged along behind in the dirt. When a holiday was encountered a bell mounted on the side of the holiday detector rang and a counter on the inside of the unit registered each holiday. Some difficulty was encountered in that the manila paper on the outside of the coating had a tendency to produce a corona effect, indicating holidays where none existed. The detector was finally operated with the bell and counter turned off, as the crack of the spark caused by the current passing from the spring to the pipe was clearly audible.

After checking with the holiday detector, a patching crew retreated all holidays and skid marks just ahead of the lowering-in crew. Three RD8 sideboom caterpillars lowered the pipe into the ditch. Backfilling operations followed immediately behind the lowering-in crew. In an effort to prevent damage to the coating during the lowering-in operations, all lowering-in was done between the hours of 5:30 and 9:30 in the morning while the pipe was cold. The progress of the patching and lowering-in crew was, of course, limited to that of the treating machine. An effort was made to keep the lowering-in operations up to within 600 ft. of the end of the previous day's treating run. The average patching and lowering-in crew was composed of the following equipment and men:

Three RD8 sidebooms, one tar pot, one foreman, three sideboom operators, 12 laborers, one tar-pot operator.

In order to eliminate idle equipment on the job during a portion of the day's operation, and to utilize all labor 100 per cent, the contractor found it advisable to divide his operations into two general groups. One consisted of lowering-in and priming during the first part of the day, and then combining the men and equipment of these two crews to apply the protective coat- machine through flexible metal hose connected to a 10-bbl. kerosene-fired pot. The tar pot supplying the enamel to the treating machine was towed alongside the treating machine by one of the sidebooms supporting the pipe. Twenty-five mining during the latter part of the day.

Inasmuch as all work was performed by the contractor, it was necessary to maintain an inspection crew on all phases of work. This crew normally consisted of five men of the following classifications:

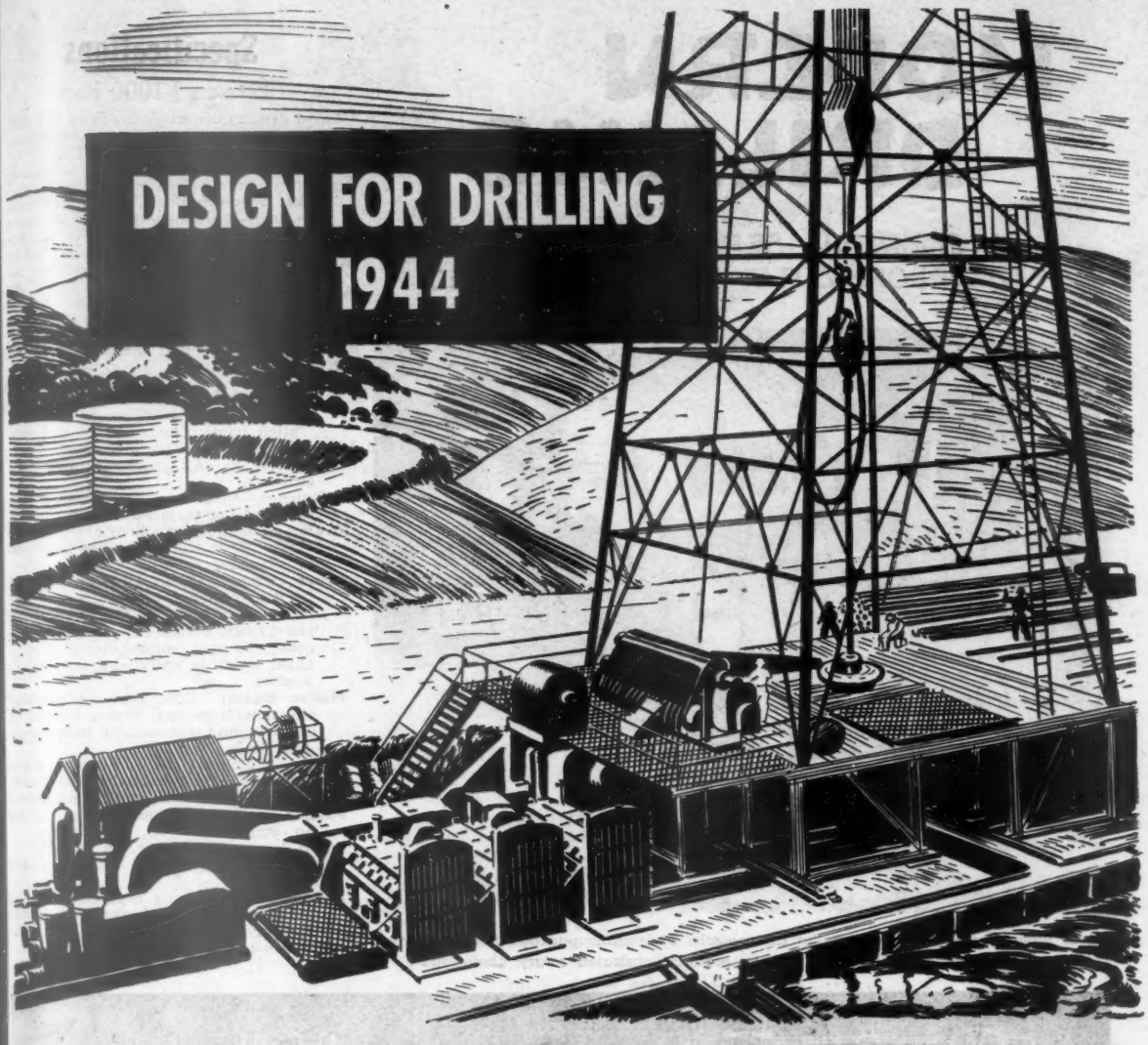
Chief inspector, welding and spot-welding inspector, priming and assistant welding inspector, treating and lowering inspector, holiday inspector.

It will be noted that portions of the inspection crew were allocated to two different operations. This was possible, inasmuch as all operations were not performed for the entire day. It was necessary to maintain an inspector immediately in back of the coating machine so that he might check any mechanical imperfections.

Conclusion

The use of a machine for application of protective coating for both single-wrap and double-wrap reconditioning jobs on large-diameter pipe is desirable because a better protective coating can be obtained with a saving in both manpower and materials. With both wrappers applied closely to the point of application of the enamel, the wrapper was imbedded in the molten enamel, assuring a tight bond. Even tension and lap of the wrapper resulted in more uniform wrapping than we have ever been able to obtain in the past on any manual application jobs. Fumes from the hot coal-tar enamel are irritating to the skin, and have been an objection to the use of this material in manually applied coating jobs. With the machine application, the number of men coming in contact with these fumes was reduced to a minimum, and a very low rate of burn accidents were experienced. Application of the coating by mechanical means required fewer skilled men than the hand application method. The contractor stated that it would have been impossible to have obtained the number of experienced men that would have been required by the manual application of protective coating on this large-diameter pipe. The reduction in the amount of skilled labor also reduced the cost of the job.

In addition to the aforementioned savings, the saving of material vital to the war effort was accomplished also through the use of the mechanical treating machine. On past jobs, the hand application of coal tar has resulted in a loss of from 10 to 20 per cent of the material. As stated before, the loss on this job was approximately 5 per cent. We believe that this method is worthy of serious consideration by anyone contemplating similar work because a better protective coating was obtained with a saving in both manpower and materials.



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Emsco builds a complete line of oil field drilling equipment—equipment built to stand up under all normal drilling operations with plus values built-in to take the abuses of shock loads when the going is tough. The Emsco line includes complete drilling rigs, draw works, crown and traveling blocks, swivels, rotary tables, slush pumps, derricks, chain, pumping units, and other drilling products. All are uniformly dependable in the service for which they are designed. All, in combination, give you a drilling design which is hard to beat.

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MODERN DRILLING

A JOURNAL SERIES ON NEWEST DEVELOPMENTS IN ROTARY RIGS

Front view of draw works, showing air controls, hydromatic package with fluid-level control and totally enclosed, telescopic, pressure-lubricated rotary chain guard

Specifications

Emsco J-1000 Rig

Rated drilling capacity: Depth of 10,000 ft. with 4½-in. drill pipe, rated maximum horsepower input of 1,000 hp.

Prime movers: Three engines, combined horsepower of approximately 1,000.

General specifications: Totally enclosed, pressure-lubricated pump; fabriform construction; telescopic oil-type guards; over-all width 8 ft.; 85-in. bearing centers on draw works; rotary drive, 3½-in. pitch single; six hoisting speeds, three rotary speeds, two reverse speeds to the drumshaft and one to the rotary; draw works chain 2½-in. pitch double.

Transmission:

Capacity.—Rated at 1,250 hp.

Drives.—Chain, pressure lubricated.

Chains.—Selective transmission, 2-in. pitch triple; compounding transmission, 1½-in. pitch quadruple.

Construction.—All units fabriform construction.

Clutches.—Disk type air-operated friction clutches throughout.

Drum: (Smooth or grooved) 25-in. diameter x 40-in. long; brake rims, 44-in. diameter x 9½-in. face.

Drum clutches: Twin Disc air-operated friction clutches on drum low and high. In addition to the air-operated low-friction clutch on drum, an emergency positive spline clutch is provided which is operated from driller's position.

Master clutch: Disk type air-operated clutch with neutral brake, located on compounding transmission forward engine shaft.

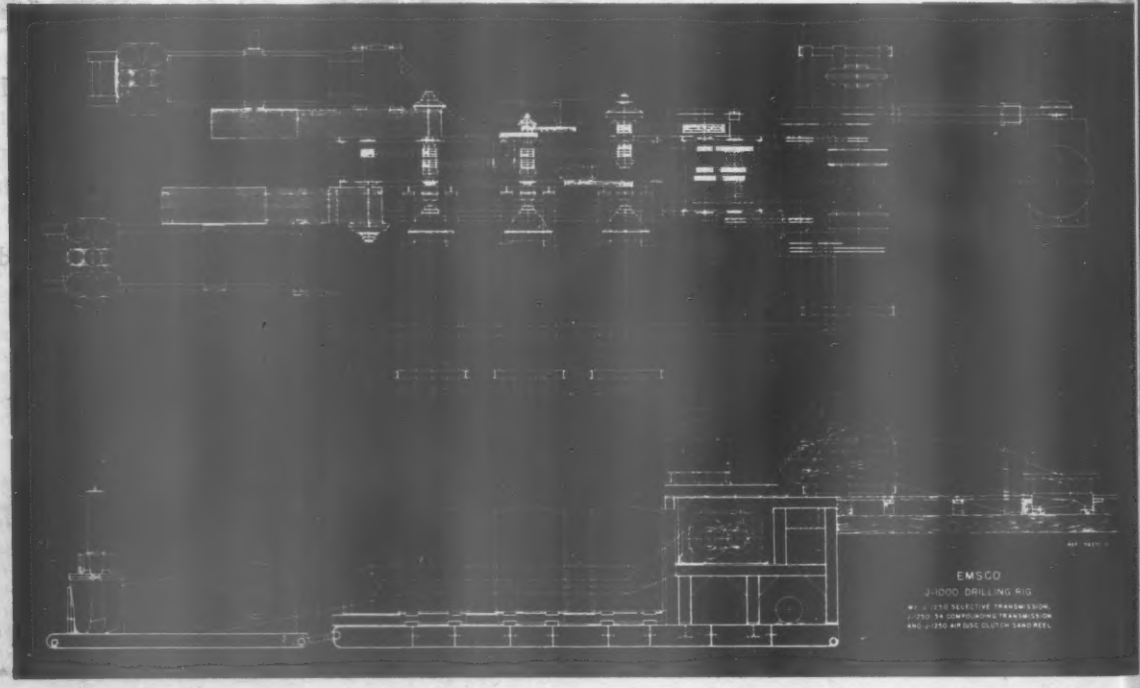
Engine clutches: Twin Disc friction clutches with flexible coupling connection to compounding transmission.

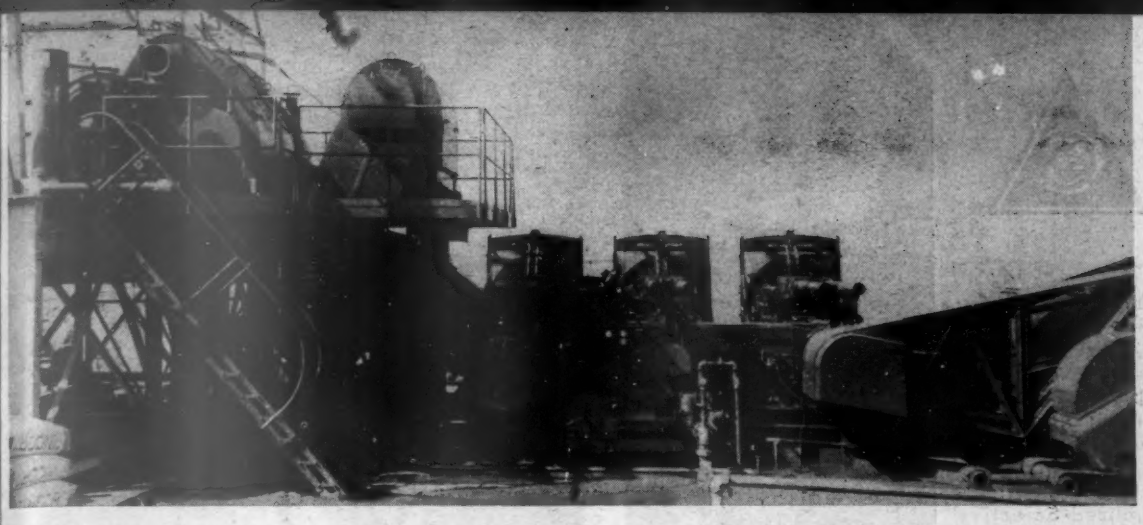
Pumps: Two pumps, one 250 hp. or 300 hp. and one 425 hp. or 500 hp.

Pump drives: Friction clutch, V-belt.

Bearings: SKF, Timken, American and Hyatt.

Brakes: Self-energizing type with 325° of lining contact on brake rims, with multiplying leverage of 54 to 1; in addition, dual rotor hydromatic.





Side view illustrating the compactness of the rig and concentration of unit weight on ground level. Also shown is the Gardner-Denver wash-down pump and friction-clutch V-belt drive. (Photos courtesy The Continental Supply Co.)

Emsco J-1000 Drilling Rig

MODERN DRILLING

THE complete drilling rig consists of a hoisting unit or draw works, a selective three-speed forward and reverse transmission, a compounding transmission, engines, slush pumps and the necessary steel mounting members. The hoisting unit and the selective transmission comprise the draw works.

Draw-Works Speeds

The draw works has six hoisting and three rotary-drive speeds, with two reverse speeds to the drumshaft and one for the rotary. The frame has an over-all length of 18 ft. and a width of 8 ft., with foot pedals removed, which allows the unit to be transported without dismantling.

Selective Transmission

The selective transmission is an independent unit. It can be set at any desired level between the hoisting unit and the compounding transmission, which shortens the drive between the selective transmission and the hoisting unit and between the selective transmission and the compounding transmission. This adapts the rig to difficult well locations, eliminates the necessity of breaking down the draw works for transportation and permits a high degree of flexibility in rigging up.

Friction Clutches

Disk type air-operated friction clutches are employed on the drum low, drum high and rotary drives. The drum low and drum high friction clutches have the air-operating mechanism built in integrally. The rotary drive friction clutch is a twin disk and is operated by an air cylinder with a spring return. In addition to the air-operated friction clutch on the drum low, an emergency positive spline clutch, operated from the driller's position, is provided in case of an extreme load or failure of the air supply.

The drum high friction clutch is on the lineshaft inside the post bearings on the rotary side.
ters the clutch through a stuffing box mounted on the end of the lineshaft. The rotary friction clutch is on the lineshaft.

A gear tooth clutch is mounted on the lineshaft to control the low drum drive and catshaft. When drilling, this clutch may be disengaged to allow the catshaft and low drum drive to remain stationary.

The master disk clutch and neutral brake is on the compounding transmission forward engine shaft. This clutch and brake is primarily for the selection of speeds in the selective transmission and, in combination with the visual speed indicator at the driller's position, allows the transmission clutches to be shifted at the proper speeds.

Variable pressure valves control the friction clutch operation. Air pressure is supplied by a compressor mounted on the compounding transmission and stored in a reservoir at 100 lb.

Valve-Controlled Clutches

Hand-operated variable pressure valves control the friction clutches and are used in conjunction with an independent foot operated throttle. One control lever operates the low and high drum friction clutches, another operates the rotary friction clutch and a third controls the master clutch and brake. A hand lever is provided for shifting the lineshaft clutch. Another hand lever controls the two clutches in the selective transmission. Foot pedals operate the automatic cathead and the emergency low speed splined clutch.

Compounding Transmission

The compounding transmission may have either two, three or four shafts and is for use with two or three engines. The slush pumps are driven from the rear engine shaft and from a separate pump drive shaft, through friction clutches and V-belts. This arrangement allows the pumps to be driven separately, in parallel, or compounded.

Self-Energizing Brakes

The main draw works brake is the full wrap, self-energizing type. Brake toggles are roller-bearing equipped. An equalizer is located on the live ends of the bands. Each band has 10 brake blocks, 1¼ by 9 by 12 in. The brake lever is equipped with a friction locking device which enables the driller to set the brake to "feed off" smoothly or to hold a load. A centralized lubrication box is provided. Brake rims are bolted between two flanges in double shear. Brake rim flanges allow the brake rims to be removed without disturbing the drumshaft clutches, sprockets or bearings.

Hydromatic-Brake Mounting

A cradle is provided on the rotary side for mounting the hydromatic brake. A multiple jaw clutch on the brake shaft engages jaws on the splined hub of the rotary idler to allow close mounting of the hydromatic brake to the draw works. The cradle mounting takes the entire torque load of the brake, which eliminates bending stresses on the drumshaft.

Right: View of Starting Engine side of Climax VU-420 H.P. 12 Cylinder Engine and Stair-Step Drive from Compounding Transmission to Selective Transmission to Drawworks, illustrating further, individualized Selective Transmission and Sub-Structure package with oil country skids. (Stair-Step Sub-Structure removable from main skid, if desired.)

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Left center: Illustration of Master Clutch and Selective Transmission Drive of No. 1 Engine Shaft of Compounding Transmission, Water Cooled Exhaust on Climax VU-420 H.P. Power Units, Gardner-Denver ADR Compressor and V-Belt Drive.

Left: View of compounding Transmission showing 300 H.P. outside Slush Pump Drive, Wash Down Pump Assembly with suction and discharge manifolding and Engine exhaust pipe supports.

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Studies Indicate Water Drives in Illinois Pools Increase Ultimate Recovery

by Kenneth B. Barnes

Many Illinois pools have well-merited attraction for increased oil recovery by water drive because the majority consist of shallow to medium-depth sand reservoirs having little or no natural water encroachment. Some of the areas are suitable for intensive input well development, others for flank water injection. The detailed studies of the Illinois State Geological Survey on natural and accidental floods, and those of the U. S. Bureau of Mines on applied water-drive projects, are reviewed and summarized, together with other data and factors on the subject.

ILLINOIS oil pools in many instances offer first-order potentialities for water-drive application. Some of the other states and areas in the United States rank higher in amounts of oil in place that are susceptible to water-drive recovery, are higher in number of current projects and general water-injection activity, and are superior in other factors. Nevertheless, the Illinois possibilities are far from marginal or only academic interest; much more so than might be inferred from the state's primary reserves of approximately 300 million barrels.

Basically, favorable factors for water flooding in Illinois include the shallow to medium depths of the producing formations, and the fact that the majority of the production is from sand reservoirs that have only very slow, if any, natural water influx or encroachment. Beneficial results from accidental and natural water floods also have been obtained in the McClosky and Devonian lime sections in some areas. There is one experimental applied water drive under way in the McClosky in the Clay City area.

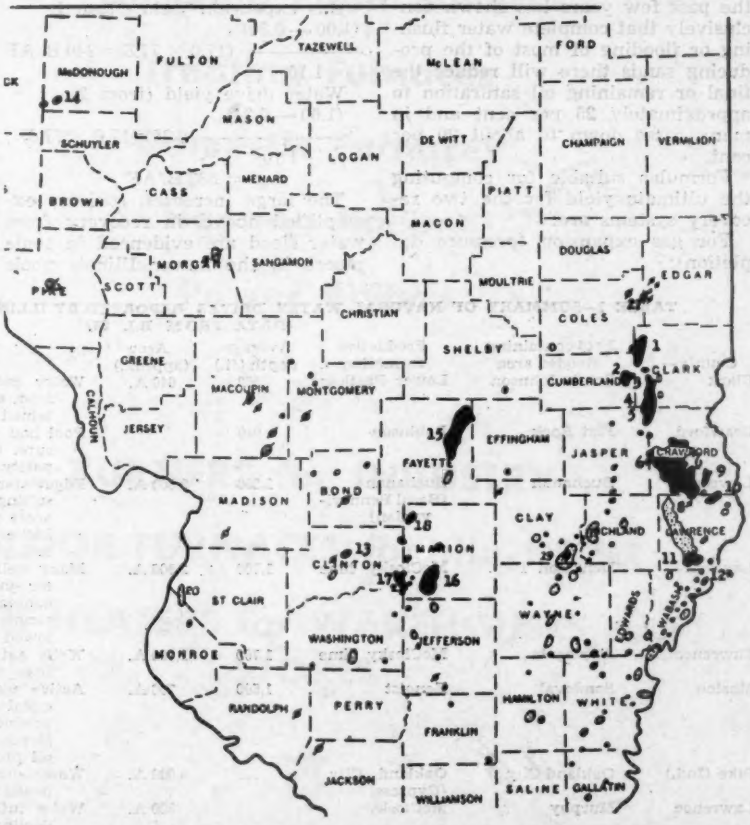
In Illinois the purposeful water driving or flooding of oil sands to stimulate recovery is permissible by virtue of an act of the legislature on June 8, 1933.

The Illinois water-drive potentialities fall into two rather dissimilar categories. The first covers the shallower pools, which may range from about 300 to 1,600 ft. in depth, where intensive or pattern-type water-injection well spacing is more feasible and can be economically employed. Currently there are a number of such projects in operation, with that in the Patoka pool of Marion County showing unusual prospects.

The Deeper Pools

The other category covers the deeper pools, where water injection on the flanks of the structure could be done to maintain or support reservoir pressure and obtain the recovery benefits possible from the water-drive process. This flank-water-injection procedure might be considered a relatively new and promising petroleum-production technique. The current outstanding and probably first substantial effort in such direction is the Midway operation[1] in the Smackover lime, Lafayette County, Arkansas.

The flank-water-injection type of operation is most suitably applied early in the productive life of a pool and accordingly there are large numbers of relatively new pools in Illinois available for consideration of such application. As mentioned earlier many of these pools exhibit but very little water encroachment.



Map of part of Illinois showing locations of a number of applied water-drive projects, and some pools having natural or accidental floods in certain formations

LEGEND

Pool and county.—(1) West field, Clark; (2) Siggins, Cumberland; (3) Casey, Clark; (4) North Johnson, Clark; (5) Bellair (gas repr.), Crawford; (6) Main, Crawford; (7) New Hebron (gas repr.), Crawford; (8) Chapman, Crawford; (9) Flat Rock, Crawford; (10) Birds (gas repr.), Crawford; (11) Lawrence, Lawrence; (12) Allendale, Wabash; (13) Carlyle, Wabash; (14) E. Plymouth, McDonough; (15) Loudon, Fayette; (16) Salem, Marion; (17) Centralia, Clinton, Marion; (18) Patoka, Marion; (19) Clay City, Clay; (20) Dupo, St. Clair; (21) Warrenton, Edgar.

Unless the influx is artificially augmented, many will obtain, during their producing life, only the oil recovery possible by the gas-expansion or pressure-depletion mechanism.

The importance of the water-drive mechanism in large part, of course, lies in its high efficiency as a recovery medium. This is because complete water drive usually will recover on the order of two to threefold the oil per unit of reservoir pay space that can be obtained by the gas-expansion or pressure-depletion mechanism. A reservoir produced by the latter type of control usually will be economically depleted when the total fluid saturation of the pore space (oil and interstitial water) is reduced to the order of about 80 to 70 per cent. (This value is variable, both above and below that stated, and dependent upon a number of factors of which the amount of dissolved gas and reservoir pressure are very important.)

In contrast, the great number of coring operations in Illinois and analyses and experiments made during the past few years has shown conclusively that complete water flushing or flooding of most of the producing sands there will reduce the final or remaining oil saturation to approximately 25 per cent and in many cases down to about 20 per cent.

Formulas suitable for computing the ultimate yield for the two recovery systems are:

For gas expansion (pressure depletion):

$$\text{(1) Ult. Rec., B/AF} = \frac{(1.0 - 0.80^*)}{FV} \times (P \times 77.6)$$

For complete water drive:

$$\text{(2) Ult. Rec. B/AF} = \left[\frac{(1.0 - W_i)}{FV} - O_r\right] \times (P \times 77.6)$$

where—

P — effective porosity, per cent
FV — formation oil volume factor
W_i — interstitial water, as fractional occupancy of P
O_r — residual oil left after complete water drive, as fractional occupancy of P

*(0.80 is value applicable to many Illinois conditions).

For purpose of illustrating the comparative ultimate-recovery expectancies for complete water drive as against gas expansion-pressure depletion, the following values for one set of Illinois sand conditions are used:

P — 17.0 per cent
FW — 1.10
W_i — 0.24 (or 24 per cent)
O_r — 0.25 (or 25 per cent)

Gas expansion yield (from 1)

$$\frac{(1.00 - 0.80)}{1.10} (17.0 \times 77.6) = 240 \text{ B/AF}$$

Water drive yield (from 2)

$$\left[\frac{(1.00 - 0.24)}{1.10} - 0.25\right] (17.0 \times 77.6)$$

$$= 582 \text{ B/AF}$$

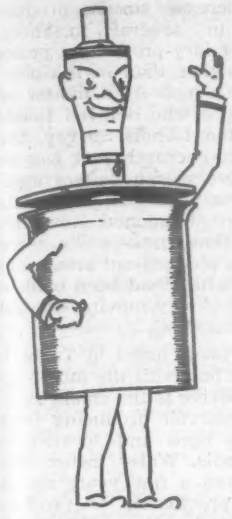
The large increases, such as exemplified above, in recovery from water flood are evidenced in some places in the newer Illinois pools where fairly active natural drives are present: Loudon pool, south end (Benoist), Dix (Benoist), Noble, localized area (Aux Vases), Centralia and Loudon (Devonian), Mount Vernon, Indiana (Waltersburg), Smith-Mills, Kentucky (Cypress, bottom water), etc.

The most recent published studies of water drives in the Illinois pools are by the Illinois State Geological Survey and by the United States Bureau of Mines. The information developed by these studies will be summarized and reviewed hereinafter, together with a presentation of other data and factors concerned with the subject. The Illinois State Geological Survey[3] considered a number of both naturally occurring and accidental water floods, with the aim of having the results available for comparisons and checks against the possibilities for artificial-water-drive application in other pools. The investigations principally were confined to the older southeastern and other Illinois stripper fields which currently are producing about 10,000 bbl. per day from some 13,000 wells. Most of these pools were developed between about 1905 and 1935 and to date have yielded approximately 450 million barrels of oil. The southeastern area produces from a number of sands from the Pennsylvanian and the upper Mississippian, and from the McClosky lime of the lower Mississippian system.

The Illinois Survey report No. 89 presented data on naturally occurring water drives in 12 of the older

TABLE 1—SUMMARY OF NATURAL WATER DRIVES REPORTED BY ILLINOIS STATE GEOLOGICAL SURVEY (DATA FROM R.I. 89)

County—	Pool containing flooded area	Productive formation	Average depth (ft.)	Area (approx.)	Comment
Clark	South Johnson	Lower Partlow	500	640 A.	Water entered lower Partlow from below, possibly from an underlying sand. Larger oil production obtained from areas eventually producing salt water.
Crawford	Flat Rock	Robinson	940	.....	Pool had original bottom and edge water under pressure. Oil recovery very high in proportion to capacity of productive area.
Lawrence	Buchanan	Buchanan (Basal Pennsylvanian)	1,250	2,000 A.	Edgewater drive advanced inwardly and upwardly, resulting in high recovery. Six leases totaling 600 acres yielded 12,600 bbl. per acre. Thorn farm has highest yield per acre of the older Illinois fields, and greatly in excess of the sand capacity.
Lawrence	Dennison Twp.	McClosky lime	1,700	2,500 A.	Many wells had secondary production peaks when water encroached. This followed original decline accompanying exhaustion of gas. Water source from connected permeable stratum. Water course followed permeable areas rather than "structure."
Lawrence	Applegate	McClosky lime	1,700	1,000 A.	Wells not yet "watered out." Recovery much higher than average "unflooded" McClosky.
Marion	Sandoval	Benoist	1,500	700 A.	Active water drive present although influx did not equal withdrawals. This caused secondary "flood" production recovery and peaks. Later, brine from Devonian production injected into Benoist tripled oil production.
Pike (Ind.)	Oakland City	Oakland City (Cypress)	....	2,000 A.	Water encroachment caused many leases to have flood peaks as high as early flush production peaks.
Lawrence	Murphy	McClosky	....	800 A.	Water influx low and wells abandoned after original decline. Wells drilled later produced flood oil.
St. Clair	Dupo	Trenton lime	575	600 A.	Vigorous water encroachment banked flood oil for recovery by Reda pumps.
Clinton	Carlyle	Cypress	1,000	900 A.	Pool had mild water encroachment. A water drive project with 29 input wells was attempted. Operation later discontinued, but injection was only 600 bbl. per acre to sand which had had recovery of 3,400 bbl. per acre.
Crawford	Parker	Robinson	1,000	.....	Early water drive over majority of pool; lease production data show benefit.
Lawrence	St. Francisville	Bethel	1,850	.....	Edgewater encroachment present; some leases had high "flood" peaks.



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pools in 7 different counties. In Table 1 are given, for the natural floods studied by the survey, the pool name and county, the productive formation, average depth, the approximate flood-affected area, and abridged comments concerning the results from the water-drive action. These 12 pool case histories are quite interesting and reveal a number of different water-drive factors and situations. In all 12 cases it was found that the water-drive action had increased production rates and ultimate recovery.

Some pools, such as Flat Rock (Crawford County), Buchanan (Lawrence County), Dupo (St. Clair County), and Parker (Crawford County) had active natural-water drives from the start and the oil recovery obtained was very high in proportion to the volumetric capacity of the productive areas. In other pools, including Dennison Township, St. Francisville, and Applegate (all in Lawrence County), and Oakland City (Pike County, Indiana), the water drive was not noticeable during the flush production period and the water influx was felt only after the wells had declined to low rates. As the "delayed" flood fronts appeared, the wells gradually increased in oil production and, in several instances, reached secondary-production peaks as high or higher than in the original or flush stage. As a matter of fact, in some of the delayed floods studied by the Illinois Survey, the natural water encroachment was so low that there was no effect upon the production of the original wells and they were abandoned. However, at a later time, new wells were drilled in the plugged-out areas, and obtained oil which had been banked ahead by the slowly moving natural water encroachment.

As to the pools listed in Table 1, probably the one with the most vigorous water drive is the small, shallow Dupo reservoir producing from the Trenton lime and located in western Illinois. Water influx was very large and a few years ago it was found practicable to produce the flood oil together with large quantities of water by the installation of submergible electrical centrifugal pumps.

The Illinois Survey investigation also collected data covering a number of accidental floods, because the evidences and results established that might have bearings for similar formations elsewhere that could be purposefully flooded. Detailed data[2,3,4], for 27 such situations were collected, covering the Biehl, Robinson, Tracy (Bethel), and Kirkwood (Cypress) sands. These floods were responsible for the recovery of 412,308 bbl. of additional oil from 40 wells, or an average of 10,308 bbl. per well. The number of acres considered to have been flooded was 115.5, which makes the average yield 3,570 bbl. per acre. The total life of the floods ranged from 1 to 20 years, with 7 being the average. The over-all average flood production per year was 510 bbl. per acre. It should be remembered that accidental water floods usually are the result of water intrusion into the producing formation from upper strata and also involve special circumstances and situations; accordingly, the number of examples is limited.

The U. S. Bureau of Mines, in Report of Investigations No. 3778[5], (August 1944), by D. B. Taliferro, C. M. Keithly, and Thomas Jennings, recently collected data on 11 applied or artificial water-drive projects in Illinois. The most recent records reported for the operations are as of July 1, 1943; however, it is understood subsequent data on some of the projects are being obtained. Pertinent material on the projects, as of July 1, 1943, as to pool, name and details of the producing formation, number of wells and spacing, date of first water injection, etc., are presented in Table 2.

Brief discussion and comment on the projects follow:

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Antonopulos Project—Warrenton Pool (No. 1)

This shallow project, located within 34-14n-14w and 3-13n-14w (2nd P.M.)*, is made up of two 5-spots, and lies at the far northern tip of the old southeastern producing belt. The B. of M. report shows a core analysis of one of the wells for the Benoist sand found between 164 and 200 ft. The permeability profile is reasonably uniform, with the average being about 40 millidarcys. The oil content profile shows only 14 ft. of the total interval to be above 20 per cent saturation, and it is questionable whether this was due to flushing of the cores or an original condition of under-saturation. The 40-acre property is credited with a past production of only 1,000 bbl. per acre.

As of the data date, from 912 to 6,911 bbl. of water had been injected into each of the six wells (total 13,200 bbl.), and the fluid level in the oil wells was reported to be 59 ft. below the surface and steadily rising.

Cokey Oil Co. Project (No. 2)

Operation comprises one five-spot pattern with an additional oil well on the outside, in 25-10n-10e (2nd P.M.) The core graph for the Siggins sand, 625-645 ft., reveals average permeability of 419 md. Here again, however, either flushing of the core, original under-saturation, or other factors may account for only 12 ft. of the cored section having oil saturation above 20 per cent. The operator is said to plan delaying pumping until sufficient water is injected to "bank" the oil near the producing well.

Forest Oil Corp. Flood 1 (No. 3)

Forty acres in SW 21-11n-14w 2nd. P.M.) of the Westfield pool, productive in the Upper Casey sand (McLeansboro group of the Pennsylvanian) were drilled on 660-ft. spacing, with nine input and four oil wells to form four five-spots. The intake wells were shot with an average of 21 qt., and the oil wells equipped for flowing. Injection of fresh water was commenced on August 10, 1942, and surface pressure of about 100 p.s.i. carried until November 30, 1942, when pressure was increased. On July 1, 1943, the total water injection was 235,860 bbl. and surface pressure 295 p.s.i. On that date the oil wells had not been produced.

Forest Oil Corp. Flood 2 (No. 4)

In the Siggins pool, NW NE 13-10n-11e (3rd P.M.), a few miles southwest of the operator's Westfield project, another 20-acre project in the Upper Casey sand was developed, with water injection beginning to all 25 input wells (440-ft. spacing) on June 20, 1942. After injecting approximately 375,000 bbl. of water, the 16 oil wells opened on March 2, 1943, and flowed. As of July 1, 1943, total water injection was 480,812 bbl. and oil production 5,021 bbl. (ratio 96:1). The previous month's water injection to oil production (53 bbl. per day) ratio was 21:1. Investigations of possible reasons for the large water production were made, and various experiments made on the input wells with bentonitic mud and other plugging material, dye tracers, electrical conductivity tests, etc. These and injectivity index data are reported to have indicated the water in large part passed through ruptures formed in the formation by the over-burden lifting.

Kewanee Oil Co. Project (No. 5)

The small quantity of water injected on the property, in 17-7n-14w (2nd P.M.), had not affected oil production as of the report date.

Niagara Oil Corp. Project (No. 6)

The property is located in parts of 29 and 30-7n-13w (2nd P.M.) It has similar status to No. 5; there

*P.M. = Principal meridian.

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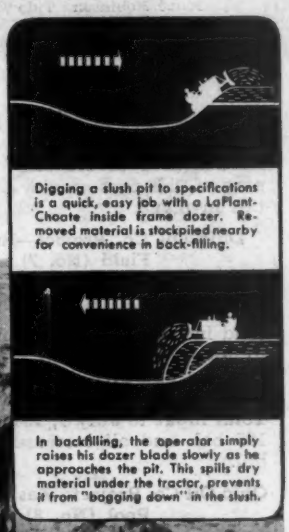

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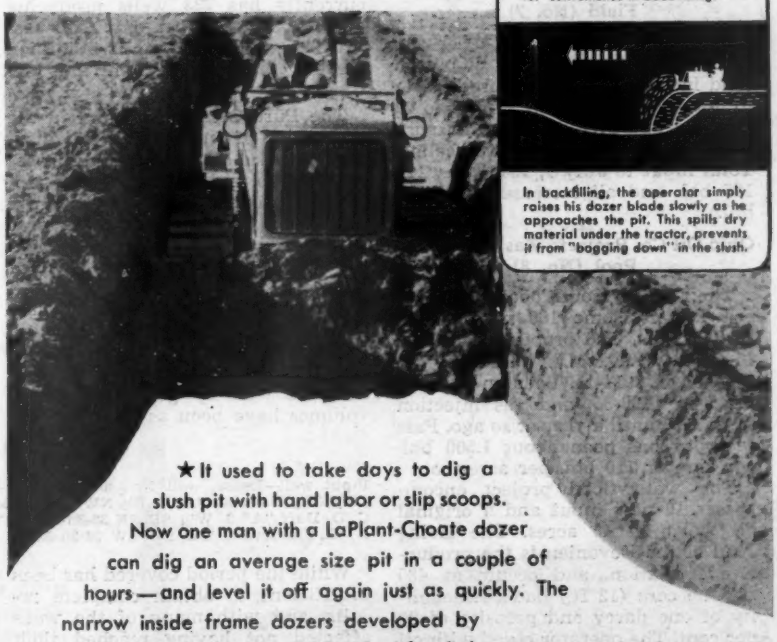

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TABLE 2—SUMMARY OF APPLIED WATER DRIVE PROJECTS STUDIED BY U. S. BUREAU OF MINES
(DATA FROM R.I. 3778)

Proj. No.	County and pool—	Name of operator	Producing formation: Name	Depth (ft.)	Thickness (ft.)	Temp. °F.	Perm. MD.	Porosity %	Crude oil at surface: °A.P.I.	Vis. CP	Wells in project: Input	Oil	Spacing	Water injection started	Cum. bbl. to 7-1-43	Source to wtr.
1.	Edgar, Warrenton	Antonopulos	Benoist	150	31-61	..	0-80	20	....	....	6	2	300	1-17-43	13,200	(*)
2.		Cokey Oil	Siggins	630	30	68	419	20	....	....	4	2	330-400	5-28-43	1,200	(*)
3.	Clark, Westfield	Forest Oil	Up. Casey	300	30-50	60	25-400	..	36.6	8.8	9	4	660	8-10-42	235,860	(*)
4.	Cumberland, Siggins	Forest Oil	Up. Casey	290	30	60	75	..	36.6	8.8	25	16	330	6-20-42	480,812	(*)
5.	Crawford, Robinson	Kewanee	Robinson	950	15	..	...	..	....	....	1 Lse.		Varies	3-24-43	1,800	(*)
6.	Crawford	Niagara	Robinson	900	20-40	..	...	..	....	....	2 Lse.		Varies	7-36	No rec.	(*)
7.	Crawford, Robinson	Ohio Oil	Robinson	908	35	84	...	..	34	6.6	1 Lse.		Varies	9-21-42	24,125	(*)
8.	McDonough, E. Plymouth	Ohio Oil	Hoing (Dev.)	485	14	68	1000	19	36.6	8.6	16	9	440	6-29-43	1,000	(*)
9.	Clay, Clay City	Pure Oil	McClosky lime	3,000	6-12	95	High	12-16	39	4.0	3 Lse.		1:20 A.	9-42	894,400	(†)
10.	Crawford-Lawrence, Robinson	Tide Water	Robinson	950-1,080	15 or more	..	...	..	....	....	6 (Incl. 5 lses.)	89	.....	1933-35	827,326	(‡)
11.	Marion, Patoka	Felmont-Sohio	Benoist	1,420	25	80	150	19-20	38.6	5.4	9 Lse.		660	10-43	.....	(§)

*Fresh water wells. †Little Wabash River. ‡Fresh and salt. §Tar Springs.

were increases in oil rate from four wells near the injection wells, but flooded area covers only fractional part of the four producing properties involved.

Ohio Oil Co. Project—Robinson Field (No. 7)

Injection of about 80 bbl. per day of fresh water into the Robinson sand increased oil from three leases in 5,5n-12w (2nd P.M.) from 9 to 22 bbl. per day in 7 months, and subsequent production had little decline. Total input to July 1, 1943, was 24,125 bbl. and oil increase was 2,386 bbl.

Ohio Oil Co. Project—East Plymouth Pool (No. 8)

The East Plymouth pool is in western Illinois, some 100 miles north of St. Louis. The properties, in N½ 15-4n-4w (4th P.M.), were first developed in 1914-15. Vacuum was applied in 1926-35, and gas injection from 1935 until a year or so ago. Past recovery has been about 1,500 bbl. per acre or 110 bbl. per acre-foot.

The water-flood project encompasses 16 new input and 9 original oil wells on 40 acres. The Hoing sand of the Devonian is the productive formation, and occurs at 485 ft. One core (12 ft.) had permeability of one darcy and porosity of 20 per cent. The operator cored with oil to obtain connate water content, and to reconstruct the oil saturation in place from that data, the past oil production, and the volumetric capacity of the sand section. Water injection was just commencing when the B. of M.'s report was prepared.

Pure Oil Co. Project—Clay City Pool (No. 9)

This project is of unusual interest because the producing formation is the McClosky lime, and the Clay City pool is the largest McClosky reservoir in Illinois. This formation consists of any porous section within the Fredonia limestone of the Ste. Genevieve formation. It is productive in many of the new pools in the southern basin. The pay or porous zone (sometimes there are two or three) is oolitic and in some physical aspects is similar to a sand. The Clay City (consolidated) area currently has 733 wells producing about 13,900 bbl. per day. The past production has been 32.4 million barrels, principally from the McClosky.

The Pure Oil project entailed the conversion of one oil well to water-input service on each of three leases in 32-3n-8e and 6-2n-8e (3rd P.M.). These injection wells were slightly over ½ mile apart, and each was surrounded by producing wells spaced one to 20 acres. Fresh water from the nearby Little Wabash River was pumped to a settling pond, and thence to the injection wells. Here, the water passes through a carborundum filter and into the well by gravity. Injected volumes have been as follows:

Input well—Lease, well No., and location—	Water injection: Cum. total Sept. '42 to July '43	Approx. aver. rate b/d
Clay City Banking "A" 8, E½ NW SE 6-2n-8e	393,358	1,400
C. D. Duff "A" 3, W½ SE NE 32-3n-8e	275,266	1,000
A. G. Stanford 4, SW SW SW 32-3n-8e	225,776	900

While the period covered has been insufficient to obtain complete results, and with many of the wells affected not having reached their peak "flood" production, the course followed by the water front has been erratic. Some wells more distant from the injection points have increased, and then flooded out, with other closer wells not changing. The B. of M. report gives a map showing analyses of water samples for chloride-ion concentration, taken from the oil wells 9 months after first water injection. Fresh water was injected and the interstitial or connate water contains about 85,000 p.p.m. of chloride. As mentioned, some nearby wells either produce no water or show but little diminution in Cl, but other wells erratically distributed exhibited low concentrations. Some of the oil wells had rapid increases in oil production, then rapid declines, with each injection well affecting one or two producers in its vicinity in such manner. Other producing wells have had more gradual increases. In Table 3 is given the oil-production history for each of the oil wells showing increases from the water injection, as reported in the B. of M. investigation.

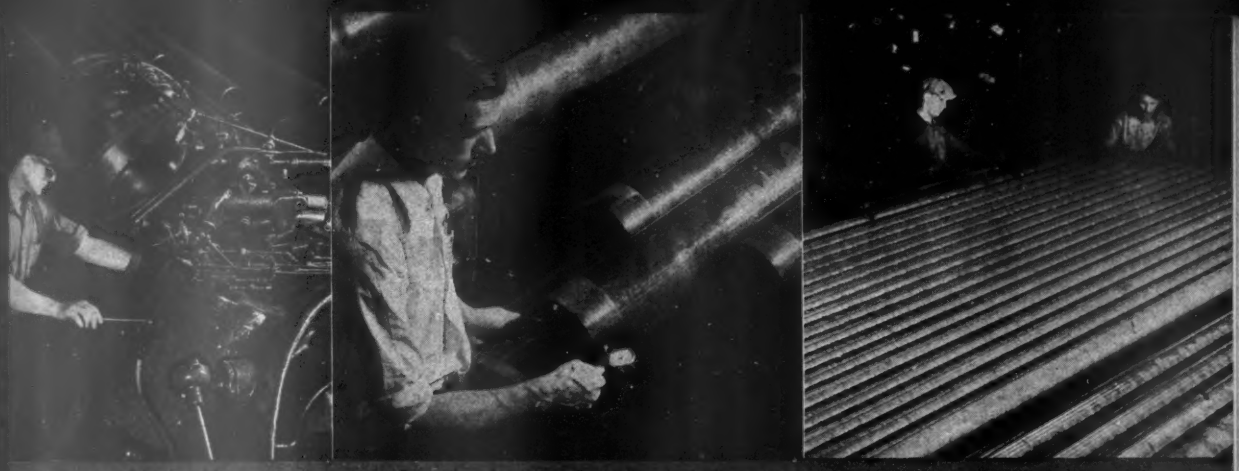
Tide Water Associated Oil Co.—Robinson Field (No. 10)

On five different leases in the Robinson field Tide Water Associated Oil Co. is injecting water into the Robinson sand which is about 950 ft. deep and 15 ft. thick. The leases are in 28 and 29-5n-11w, 9-7n-12w, 17-7n-13w, and 12-7n-14w (2nd P.M.) There is one water input well on each of four leases, and two on the fifth. Water injection to the respective leases was started between 1933 and 1935 and by July 1, 1943, the cumulative totals were: 218,685, 318,000, 145,232, 57,745, and 87,664 bbl. Corresponding peak oil increases were 5¼, 1¾, 1¼, nil, and 1¼ bbl. per day. While these increases are certainly not large, the effective area flooded was small.

Felmont Corp. and Sohio Project—Patoka (No. 11)

This operation easily is the most interesting and promising applied water-flood project of the intensive or pattern type in Illinois and commercially it may point the way in the future to similar technique to other such relatively shallow pools of good pay quality as Centralia, Salem, Loudon, St. James, etc. The B. of M. R. I. 3778 gives the fol-

(Continued on page 109)



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Processing of West Texas Sour Crudes At Shell's Wood River Refinery

*by L. R. Gray**

Washing and hot settling crudes removes about 85 per cent of contained salt by methods here discussed. The equipment, details of procedure and results are discussed fully in this article which is the second part of a discussion which began in last week's issue. Special maintenance and safety methods are required for plants operating on sour crudes—gas masks to protect against hydrogen sulfide, testing equipment, etc. These methods as applied to different operations and units in the refinery are covered briefly.

DESALTING operations at the Shell Wood River refinery have been confined primarily to two crudes, West Texas and Kansas-Healdton. Operation on the former crude is consistently good and has been standardized. The results obtained on Kansas-Healdton are not as satisfactory, and the operating procedure is still undergoing development.

West Texas crude charged consists of a mixture of southwestern crude, of which the following composition is typical:

	Per cent volume
Natural gasoline	6.6
New Mexico	23.9
West Texas	63.2
North Texas	2.7
Wildcat Jim	3.6

The method of desalting consists of contacting the crude with water, followed by hot settling under pressure. Under the conditions employed, a salt removal of about 85 per cent is regularly obtained, the salt content of the washed crude being about 10 lb. per 1,000 bbl.

Equipment

Two 35,000-bbl.-per-day three-column topping units are equipped with desalting facilities, which include the following items of equipment:

1. Three vertical salt settlers, each 10 ft. by 40 ft. equipped with an oil distributor spider, and trylines. Each distributor is constructed of four parallel horizontal sections of 3-in. pipe connected to a 6-in. header, drilled with 1-in. holes on 1¾-in. centers looking up alternately to right and to left at an angle of 30° from the vertical. Trylines are provided on each settler, located on 2½ to 3-ft. centers.
2. Water injection pump.
3. Caustic injection pump.
4. Brine recirculation pump (on one unit only).
5. Mixers for contacting the crude with water. Duriron, Hi-Hat, and globe valve mixers have been used.

The flow through the system is as follows: Crude oil is preheated in heat exchangers to a temperature of 220°-240° F., after which water and caustic solution are injected into the crude stream ahead of the mixers. Following the mixers, the crude water emulsion enters the settlers through the distributor. (A brine level of 24-27 ft. is maintained in the settler, so that the distributor is located 21-24 ft. below the water-oil interface.) Desalted oil flows out the top of the settler, while brine is drained from the bottom of the vessel using a Hancock "Flo-Control" valve to control the brine-oil interface.

Factors Affecting Desalting

Salt is present in crude oils in two forms: (1) As brine droplets dispersed in the oil, and (2) as microscopic particles of solid salt. Both forms are frequently protected by a layer of wax or natural emulsifying agent in the crude. In order to remove the salt, it is necessary to mix intimately the crude oil with water, forming an emulsion, which then must be broken in the settling vessel. Several factors are of importance in the two operations, and are considered below. It is emphasized that these results apply primarily to West Texas crude.

(A) Intimacy of mixing.—Approximately 30 p.s.i. pressure drop across the mixers appears to be optimum for maximum salt removal. Higher pressure drops result in the formation of more stable emulsions, which are difficult to break; lower pressure drops do not disperse the water injected sufficiently, and desalting efficiency is reduced.

(B) Volume of water injected.—Normally the water injection rate amounts to about 2.5 per cent vol-

Tubular exchangers, condensers and coolers, with Nos. 2 and 3 towers in left background and salt settler at extreme right. A part of topping unit No. 4 which processes West Texas crudes at the Wood River refinery of Shell Oil Co., Inc.

*Chief technologist, Wood River, Ill., refinery, Shell Oil Co., Inc.

ume of the crude, although the actual value is dependent on the salt content of the crude, and the brine concentration maintained. The latter will be discussed below.

Brine recirculation facilities were provided in the original installation (to permit recycling up to 20 per cent volume of brine), but have been found unnecessary. Actually somewhat higher salt removal efficiencies were obtained immediately after recirculation was discontinued, although this may be partially accounted for by an increase in the temperature in the salt settlers which occurred at the same time.

(C) Position of water-oil interface relative to the oil-injection point.—Injection of the emulsified water and oil into the aqueous phase has been found to be essential to good desalting. The position of the interface exerts a considerable influence on the results obtained, as indicated by the data shown in Table 1.

TABLE 1—EFFECT OF INTERFACE LOCATION ON SALT REMOVAL

Height of interface above oil inlet (ft.)	Salt removal per cent
2	35
5	85

Further development work indicated that most satisfactory operation resulted when the brine-oil interface is maintained about 20-25 ft. above the oil-injection point. This indicates that demulsification occurs largely during the passage of the oil droplets through the aqueous phase.

The position of the brine-oil interface is considered to be that point where appreciable oil has started to separate. Actually, the crude at higher levels contain considerable quantities of water, as shown in Table 2. For the case shown, the interface is said to be 8 to 9 ft. above the inlet.

TABLE 2—WATER GRADIENT IN SALT SETTLER

Distance below inlet (ft.)	Distance above inlet (ft.)	Water, per cent volume
1½	...	100
4	...	100
...	1½)	
...	4)	95-98%
...	6½)	
...	9	80
...	11½	70
...	14	50
...	16½	35

(D) Brine concentration.—Operating experience indicates that a brine concentration of 2.5-4.0 lb. salt per barrel of brine is desirable for maximum salt removal and minimum water consumption. This is shown by data in Table 3. The improved salt removal obtained may be attributed to two factors: (1) Stronger brines contain higher concentrations of those demulsifiers which occur naturally in the crude and which are extracted by the caustic soda injected into the crude and (2) a greater differential in specific gravities of the salt solution and the crude.

TABLE 3—EFFECT OF BRINE CONCENTRATION ON SALT REMOVAL

Salt content of brine, lb. salt per bbl.	Salt content of washed crude, lb. per 1,000 bbl.	Wtr. content of washed crude, per cent volume
.08	41	2.5
.11	25	0.7
.16	16	0.5
.19	15	0.5
.26	11	0.2
2.07	12	0.3
2.32	9	0.2
2.62	10	0.3
3.51	8	0.3
4.66	12	0.1
5.27	15	0.2
7.20	26	0.4

(E) Effect of pH of brine.—The pH of the brine should be maintained at a relatively high value (8.0 to 9.0 is about optimum) by the injection of 5° Be. caustic soda solution into the crude stream ahead of the mixers. Caustic consumption is low (about 0.01 lb. per bbl. crude, or less) and the higher pH, in addition to improving salt removal, tends to reduce corrosion to the salt settlers. Partially spent soda from SR naphtha scrubbers (for removing H_2S) can be used without deleterious effect to desalting efficiency.

(F) Operating temperature.—Temperatures of at least 200° F. should be maintained in the salt settlers, and 250° F. is highly desirable, since the higher temperature is of value in breaking emulsions. At present the settlers at this refinery operate in the range of 220°-240° F.

(G) Operating pressure.—The pressure is not a vital consideration. It is only necessary that the pressure be maintained high enough to avoid appreciable vaporization. The operating pressure used at this refinery is about 150 p.s.i.

(H) Residence time.—High residence times are of value in obtaining maximum salt removal. The data included in Table 4 will illustrate this effect. It is recommended that the throughput be limited to 500 bbl./hour/settler for 10-ft. by 40-ft. settlers. Vessels of other sizes may be used, but the throughput should be limited in proportion to the available residence time for the oil. Vertical vessels of smaller diameter have not been used, and no data are available concerning their efficiency. With vessels of very small diameter, the vertical oil velocity may increase sufficiently to reduce appreciably the rate of settling of the water, and, consequently, salt removal.

TABLE 4—EFFECT OF RESIDENCE TIME ON SALT REMOVAL

Throughput, bbl./hr./settler	Salt content, lb./1,000 bbl. Crude charge	Desalted crude
510	59	6
600	59	16
675	59	23

Of course, other methods of coalescing the dispersed water have been proposed, among which are the following:

1. Gentle agitation. This is carried out by passing the oil-water emulsion through long pipes at relatively low velocity. The mixture is introduced into a settling vessel to permit separation of the two phases.

2. Solid contact. This method utilizes a vessel packed with Raschig rings, steel wool, glass wool, excelsior or similar materials to coalesce the water. Final separation occurs in a settling vessel which follows:

3. Centrifugal. The dispersed brine may be removed by centrifuging the crude oil.

The first of these methods is recommended by certain suppliers of proprietary treating agents and demulsifiers for salt removal. The second has been used successfully for coalescing water and treating agents in other products but we have had no experience with them in the desalting of crude.

(I) Accumulation of solids at water-oil interface.—Erratic operation in the past has been traced to an accumulation of solids (primarily sand and tank scale) at the water-oil interface, which stabilizes the water-oil emulsion, resulting in high water entrainment, and poor salt removal. The difficulty can be eliminated by bypassing the settler and draining the interface material through the trylines.

(J) Initial salt content of the crude.—The salt content of the washed crude is not appreciably affected by the salt content of the crude charged. Within the range of 50-100 lb. of salt per 1,000 bbl. of raw crude, the salt content of the washed crude remains constant at about 10-12 lb. per 1,000 bbl.

(K) Oil in effluent brine.—No difficulty has been experienced with oil entrainment in the brine drained from the salt settlers; the oil content of the brine is consistently in the range of 0.003 to 0.007 per cent volume. The brine is drained directly to the sewer without further treatment.

(L) Typical operating results.—Table 5 is included to show typical operating data when desalting West Texas crude. These data are representative of daily routine operating results at the present time.

Desalting Kansas-Healdton Crude

Experience has shown that Kansas-Healdton crude cannot be satisfactorily desalted using the procedure applied to West Texas. Mixing immediately preceding the salt set-

TABLE 5

Crude intake, bbl./hr./settler	485
Height of interface above injection point, ft.	21
Temp. at inlet to settler, °F.	230
Water injection, per cent volume of crude	2.5
Brine circulation, per cent volume of crude	None
pH of brine	8.5
Brine concentration, lb. salt/bbl.	3.13
Settler pressure, p.s.i. gage	160
Water content of crude, per cent volume	0.1
Water content of washed crude, per cent volume	0.1
Salt content of crude, lb./1,000 bbl.	90
Salt content of washed crude, lb./1,000 bbl.	10

tlers resulted in the formation of a relatively stable emulsion, with consequent high water carryover and poor salt removal.

Recently, favorable results have been obtained by recirculation of brine without fresh-water injection (caustic is injected, of course, to maintain the pH). The brine is injected into the crude stream ahead of the five heat exchangers in series. The brine-oil mixture is gently agitated by the turbulence resulting from the passage through the heat exchangers, and no additional mixing is provided ahead of the settlers. Some water emulsified in the crude charge is removed and the salt content of the brine increases during the run. Since the topping unit is operated alternately on West Texas and Kansas-Healdton crudes, this procedure is feasible; the brine concentration is reduced to normal by water injection during West Texas runs.

Use of demulsifiers.—Some tests have been made of commercial demulsifiers for crudes other than West Texas; however, we have not found it necessary to apply these materials to our West Texas crudes.

Corrosion to salt settlers.—Corrosion to the salt settlers is confined primarily to the bottom head and bottom shell region, where maximum rates of 11/64 in. per year and 7/64 in. per year have been experienced. The corrosion appears to be the result of oxygen attack, accelerated by sulfide in the presence of water. Oxygen enters dissolved in the water injected, while sulfide is due to H_2S present in the crude.

A ¾-in. ganister liner (Lumnite cement and ground brick ganister) has been installed in all salt settlers. Performance of the liner has been satisfactory. No deterioration of the cement has been observed in more than 2 years of service.

Analytical Methods

The water content in the crude oil is determined by the standard A.S.T.M. distillation procedure.

Salt in crude oil is determined as follows: To 200 cc. of crude oil are added, in order, 30 cc. alcohol, 30 cc. acetone, 50 cc. benzol, and 200 cc. distilled water. The mixture is shaken after each addition, and 15-20 minutes after the water is added. Occasionally more benzol is required to break emulsions.

A 50-cc. aliquot of the aqueous layer is titrated with standard silver nitrate (0.1N for high concentrations, 0.01N for low contrations) using potassium chromate indicator. Results are reported by calculating the chloride so determined as pounds NaCl per 1,000 bbl. crude. Note that in the calculations, allowance should be made for the alcohol and acetone, both of which are present in the aqueous layer.

Salt in brine is determined by direct titration of the brine with standard silver nitrate and potassium chromate indicator. Results are reported as pounds NaCl per barrel of brine.

Justification for Salt Removal

Justification for desalting can be summarized under two major groups: Reduction of corrosion, and reduction of cleaning of furnaces, heat exchangers and distillation equipment. Admiralty, the exact effects of desalting may vary widely in different refineries, depending on a large number of equipment design and operating factors; nevertheless, these results should be of advantage for a preliminary estimate of profitability.

Maintenance cleaning costs on heat exchangers are definitely reduced by salt removal. On topping units it was found that desalting reduced the cleaning cycle for the residue to crude heat exchangers from 4 to 8 weeks to 8 to 12 months. No advantage is gained in the other heat exchangers since these are used to preheat the crude prior to desalting.

A reduction in cracking tube deposition can also be claimed. No exact data are available, but indications are that no considerable portion of the tube deposit is salt. The effect is exaggerated when an alkaline agent is injected into the cracking unit charge to reduce corrosion. When using soda ash as a corrosion inhibitor (0.5 lb. per barrel) at a cracking plant, the heavy-oil-furnace run length was reduced from a normal of 60 to 70 days to 30 days as a result of soda ash injection. The salt content of the topped crude charged at the time of this test was about 100 lb. per 1,000 bbl. of topped crude. The solids remaining in the tube after steam-air decoking were 80 per cent water soluble, of which one-third was soda ash, and two-thirds salts normally found in crude oils (NaCl, $CaCl_2$, etc.). No data are available to indicate the effect of salt alone; however, when charging residues of much higher salt content, or when

A view of one of many plants designed and constructed by Petroleum Engineering, Inc., in the past 15 years of continuous service to the industry. *Petroleum Engineering, Inc. Offices Tulsa and Houston.*

operating for runs longer than 60 days the effect may be appreciable.

Desalting crude oils reduces corrosion in both topping and cracking units. Not only are salt solutions corrosive to steel of themselves, but at elevated temperatures certain chlorides, principally magnesium chloride, hydrolyze forming HCl, which is extremely corrosive, especially in condensers and other similar locations where it comes in contact with liquid water. (A summary of the corrosive action of salt, as well as desalting methods may be found in the Bureau of Mines Report R.I. 3422—"Desalting Crude Petroleum—A Review of the Literature".)

On topping units a reduction of heater tube corrosion of 27 per cent was attributed to desalting. No data are available to indicate the effect on process lines and vessels; however, it is felt that desalting will be of some value here. It should be noted that these results are based on use of carbon steel pipe. Alloy piping is used at the topping units to only a limited degree, and no evaluation of its resistance to salt attack can be made.

On cracking units it has been found that desalting reduces corrosion of the heavy oil furnace tubes some 35 per cent. This applies to the use of 5 per cent chrome, 0.5 per cent molybdenum tubes. Lime injection (0.5 lb. per bbl. charge) was employed during the entire test period. Under the same conditions, a reduction of 23 per cent was observed in coker-furnace tube-corrosion rates.

Some data are available to indicate the effect of desalting on steel cracking tubes without lime injection. A 50 per cent reduction was observed in this case following the inauguration of crude desalting. The data were obtained at different times, however, and should be used with some reservations, especially since the ratio of sweet to sour stocks in the residue charged to the cracking unit increased during the test period.

No information is available to show the effect of desalting on process line and vessel corrosion in cracking plants. Undoubtedly a reduction occurs; however, a quantitative evaluation of the advantages of desalting has not been possible.

In addition, desalting of crude oils produces residual fuel oil of a lower b.s. and w. and ash content, asphalts of a higher CCl_4 and CS_2 solubility, and coke of lower ash content. Evaluation of these factors must, of course, be applied to each refinery separately.

Maintenance and Safety Practices

The chief hazards involved in the processing of sour crudes are asphyxiation by H_2S vapors, and fires caused by the spontaneous ignition of pyrophoric iron sulfide upon exposure to air. The former hazard is avoided by the use of gas masks in any location where high concentrations of H_2S exist. The latter hazard occurs in tube bundles and tanks, especially those handling light distillates, such as gasolines and naphthas, containing H_2S. This hazard can be eliminated to a considerable degree by treating to remove H_2S as soon as practicable in the process system. This is done on the topping units where straight-run gasoline and straightrun naphtha are caustic scrubbed before leaving the units. The caustic scrubbing has the additional advantage of reducing corrosion to lines, tanks, etc.

Gas masks used in the refinery are of three types. Canister-type gas masks fitted with canisters for hydrocarbon and acid gases are used most frequently for general service, such as gaging and sampling crude and other tanks from which H_2S fumes are evolved. Blower masks (hose masks) are used for prolonged work in gaseous or oxygen deficient atmospheres. The blower supplying air is hand-operated for maximum reliability. Oxygen masks are also available for work in oxygen-deficient or gaseous atmospheres. These are used instead of blower masks when the time required is relatively short, since less equipment must be moved to the job site. These masks will furnish oxygen for at least 1 hour.

All respiratory equipment used should have the U. S. Bureau of Mines approval.

H_2S is qualitatively determined by the use of lead acetate paper. Where any question of concentration exists, a hydrogen sulfide indicator is used.

Routine operating and maintenance practices have been established and are discussed below. The procedures used when opening vessels for inspection and maintenance are standard, and no distinction is made between sweet and sour crudes.

Handling West Texas Crude

Since all crudes are received in this refinery by pipe line, the operating problems involved in handling sour crude are restricted to gaging and sampling tanks. Each tank gager is issued a gas mask for use with West Texas crude tanks. In cases where H_2S is especially severe, it is required that no man ascend to the top of the tank unless another man is nearby to aid in case of emergency. Warning signs are placed at or near the ladder or stairway on each tank containing West Texas crude. These precautions are also taken on product tanks storing oils from which H_2S is or may be evolved.

Warning signs should also be placed at sewer separator boxes and similar equipment from which H_2S may be released.

Sour crude was received at this refinery in tank cars a number of years ago. Precautions were similar to the above in that each operator was provided with a gas mask for use when opening hatches and gaging cars. In other respects, normal tank-car unloading procedures were followed.

Fractionating Towers

Topping unit fractionators following shutdown of the unit are steamed from the bottom for 2 hours, with water condensate drained from the tops receiver to the sewer. Water is then introduced into the top of the column through the reflux line and the column washed until no trace of oil is evident in the water drained from the bottom. This usually requires about 4 hours. When the water wash is complete, the top manhole is opened and a steam aspirator is placed in the manway. Steam is again introduced into the base of the column for 1½ hours, after which the bottom manhole is opened and the column is cooled by air circulation induced by the steam aspirator. During this period blinds are placed in all lines entering or leaving the column. Before maintenance crews enter the vessel the atmosphere is tested for combustible gases, using a combustible gas indicator calibrated for methane. Cases where the above procedure has failed to render the column gas free are very infrequent. Of course, any column which is free of combustible gases is free of H_2S.

The procedure used at the cracking plants is slightly different. The column after being drained, is steamed for 1½ hours, after which water is introduced into the base of the column and oil floated out overhead. (The coke chamber cooling pumps and facilities are used for this purpose.) If maintenance work is to be done to the condensers, the water is allowed to overflow through the vapor line for ½ hour to wash the bundle. The fractionator is then drained, manholes opened and a steam aspirator placed in the top manway. All lines are blinded and the atmosphere tested for gas in the same manner as topping columns.

The major reason for the variation in procedure is the availability of existing facilities for filling the cracking unit columns.

Other Vessels

Salt settlers and similar vessels not equipped with internal trays or baffling, at the topping units are drained through the dropout line, after which the top head is opened and the vessel steamed to the at-

mosphere. The bottom manhole is then opened, an aspirator is placed at the top manhole and the vessel cooled by air circulation.

Reaction chambers, flash chambers and similar cracking unit vessels are steamed out for 1 hour through the pressure drain line to the cracking unit blowoff pits. Water from the coke chamber cooling system is introduced into the vessel and discharged to the blowoff pits. Water circulation is continued until the vessel temperature drops to 150° F., after which the vessel is opened. Steam aspirators are placed, and the vessel is blinded and tested for gas as above. About 4 to 6 hours are required to cool the vessels in this manner.

Coke chambers are steamed from the bottom for an hour, after which water is introduced into the bottom of the chamber to cool the coke bed. About 6 hours are required to cool a 13 by 50-ft. chamber. The atmosphere is tested for gas as soon as the top head is opened. No aspirators are used since the chambers are decoked hydraulically, and it is not necessary for men to enter the vessel.

Furnace Tubes

Topping heaters are normally "circulated" down. After cutting fires, cold residue is charged from a storage tank to the heater through the circulating manifold. The hot residue from the heater outlet returns through a dropout cooler to the storage tank. When the outlet temperature of the residue reaches 300° F., circulation is discontinued, and the heater tubes are steamed for 2 hours, after which they are opened for cleaning and inspection.

Cracking-heater tubes are dropped out as soon as fires are cut, and steamed for 2 hours, after which they are opened.

Tanks

Tanks are pumped out through the water draw, followed by water to float the remaining hydrocarbon, and the liquid drawn to the sewer. Steam is introduced and continued until the tank is vapor free. Aspirators are placed in roof manways to induce ventilation. If b.s. is present, blower masks are used by men working in the tank until the sludge deposit has been shoveled out. All rafters and horizontal surfaces in tanks in sour naphtha or gasoline service are thoroughly cleaned to remove iron sulfide (which may be pyrophoric). On other tanks, cleaning is usually confined to the bottom of the tank, unless inspection work is to be done.

Fire Hazards

Tube bundles in gasoline and naphtha service frequently contain pyrophoric iron sulfide. Fires from this source can prove very serious. Cases are known in which the tube bundle was completely destroyed by fires resulting from spontaneous ignition of sulfides. Water hoses played on the bundle as it is pulled from the shell will eliminate this hazard. The exchangers should, of course, be flushed with water before opening.

Tank fires have been known to be caused by the combustion of pyrophoric iron sulfide. Floating-roof tanks are most susceptible, since the lowering of the roof as the tank drops to low gage exposes tank wall surfaces to the atmosphere. The hazard can be reduced by maintaining roof seals in good condition.

Disposal of Spent Chemicals

In the refining of West Texas crude, sulfuric acid and caustic soda are utilized for sulfur reduction and H_2S removal. Disposal of the spent chemicals may prove to be a problem. Sodium sulfide solutions and acidic wastes should not be permitted to mix in the sewer system because of the release of H_2S which would result. One solution is the installation of a separate drainage system for spent caustic solutions. The alternate to this is to schedule drainage of chemicals to the sewer. In a typical system of this type, caustic wastes may be drained during the first 2 hours of each shift and acid during the fifth and sixth hours. During the second and fourth 2-hour periods chemical draining is prohibited. In these periods, the sewer system is washed free of chemical waste. This schedule should be modified to suit the particular conditions at any refinery.

Any mercaptans present in spent sodas should be removed before discharging to the sewer. This can be done by steam stripping the spent solution. Direct injection of exhaust steam into a packed or plate column is satisfactory. The vapors from the top of the stripper may be vented to a nearby heater for disposal.

In some cases, the discharge of sulfide-spent caustic itself may be undesirable especially if the stream to which wastes are discharged is the source of supply of a domestic water plant. Small amounts of sodium sulfide are not serious, of course, but large amounts may impart an undesirable taste to the drinking water. If this situation exists it may be necessary to install neutralizing facilities for sulfide-spent caustics. Acid sludge can be used as the neutralizing agent, thus converting the sulfide salts to sodium sulfate. The H_2S gas produced is vented to a heater where it may be used as fuel. The oil released from the acid sludge is recovered and used as refinery fuel. In operating this system, the aqueous solution from the neutralizer is maintained at ½ to 1 per cent free acid. Homogeneous lead lining is recommended for the neutralizing vessel, although a monel-lined steel vessel is also suitable.

Spent-Caustic Content

If the spent caustics contain appreciable quantities of acid oils (alkyl phenols) the effect on drinking water supplies becomes extremely serious, since phenols, after chlorination in water plants, are distasteful, and may be detected in concentrations of one part in 1 billion of water. Neutralization of phenolic wastes is necessary in this case, and settling of the aqueous layer in lead-lined tanks is recommended in order to eliminate all acid oils entrained in the weak acid prior to draining to the sewer.

Acid sludge can be disposed of in three ways: burning under boilers, burning in sludge ponds located well away from the refining area, and acid recovery units, which produce fresh acid for process use. The first two methods are used at this refinery. Burning of the sludge is carried out in a Duncan sludge burner.

C. E. Emmons of the technical and research division, was elected president of the Texaco 25-Year Service Club of Los Angeles at its annual meeting. **A. D. Walker,** Los Angeles Works, who completed 35 years' service with The Texas Co. in September, was elected vice president; **W. D. Stewart,** retired, treasurer; **Adalberth Dunlevy,** technical and research division, secretary.

Sgt. Blake M. Sellers, seismograph shooter on a Humble Oil & Refining Co. exploration crew before he entered war service, is using his technical skill now in maintenance and repair of radios used in P-47 Thunderbolts at a fighter training station of the Eighth Air Force in England.

Ellis C. Beegle, Clarion, Standard Oil Co. of Pennsylvania, was elected chairman of the Clarion County division, Associated Petroleum Industries of Pennsylvania at a recent meeting. **H. J. Heffner,** Hawthorn, was chosen vice chairman and **Earl Shay,** Knox, secretary.

Shapleigh G. Gray, for the past 7 years district geologist in Houston for Tide Water Associated Oil Co., has opened an office in that city as a consultant in petroleum geology and engineering. Following his graduation from University of Missouri Gray was in the geological department of The Texas Co. for 11 years.

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Abstracts of A.A.O.D.C. Papers

(Continued from page 67)

ized for catheading. Steam and electric rigs also might utilize this development and thus reduce weight and consequent costs.

The prime cause for mechanical failure of power rigs is the high starting torque requirement for hoisting. This applies equally to the hoist and internal-combustion engines. Increasing use is being made of torque converters or hydraulic drives for constant engine speeds. Problems in the use of hydraulic drives arise from the inadequate capacity of drives now on the market and from overheating. These problems are expected to be overcome. Hydraulic drives will require transmissions designed to handle greatly increased torque. It is not practical to place torque converters between the engines and the transmission on rigs which have not been designed to handle the additional torque.

For deep drilling (10,000 to 15,000 ft.) where cheap fuel and abundant water are not available, increasing use will be made of direct current electric rigs, powered by internal-combustion engines, totaling 1,000 to 2,000-hp. diesel engines, supercharged to deliver 600 hp. and weighing only 25 lb. per horsepower, are now being made for war use and these will be available for rig service after the war. The industry will be able to get an adequate supply of men trained in diesel and electric maintenance as result of present Navy training program. Simplification of control of direct current equipment is needed and will be devised.

Magnetic or electrical braking for draw works and hoists will be developed, which will reduce the weight required for auxiliary brakes. Increased diameter of drum centers for hoists of all sizes will improve wire-rope performance and should shorten the distance between bearing centers due to the greater capacity of the larger drums.

The tendency toward increased sheave diameters will continue. Greater bearing capacities will be obtained by mounting sheaves on drums rather than shafts. Need for weight in traveling blocks will be decreased directly in proportion to improved efficiency of roller bearing drums. All bearings, side plates and bars of traveling and crown blocks will be made of lighter metals, such as magnesium, properly alloyed.

Size and weight of swivels are being reduced by better load distribution and use of better steel in the bodies. Finer bearings are being utilized. The idea that it is necessary to build swivels of great size and weight is passing. Two swivels, one weighing 6,000 lb. and the other 3,500 lb., that can handle 15,000 ft. of 4½-in. drill pipe already are on the market.

Rotaries now capable of all requirements up to top speeds of 500 r.p.m. are being manufactured. While no reduction in weight has been attained, the use of lighter metals both for the base and for the table top should be possible and should cut the weight in half.

Pumps continue to get heavier as capacities increase. Reduction in weight of pumps is confronted with a number of problems. Size and weight are increased by use of cast steel ends. These cut out easier than alloyed iron ends but are more easily repaired. Important developments are being made in power pumps. These pumps in past have been limited by inadequate power ends. Until recently the largest power pumps have been for approximately 425 hp. Pumps having 700-hp. power ends are being designed. Triplex pumps will find greater use and reduce peak loads.

Improved boiler performance is being made possible by increased furnace volume and decreased length of tubes. Because of greater tensile strength of plates, 150-hp., 300-lb. working pressure boilers now weigh no more than old 125-hp. boilers. Trends are toward still greater tensile strength and reduced thickness of plates.

The most common type of drill pipe and tool joint failure, that of the last engaged thread, is being eliminated. Pipe having reduced wall strength but greater torsional strength will become available. This will help to reduce the hazard of twist-offs. Similarily, kellys and drill collars will be improved.

Use of collapsible bits which can be run in the hole and retrieved by wire line, thus eliminating trips with the drill pipe, are expected to become more practical. It also is probable that sometime in the future independently operated bits driven by fluid power may come into use.

Drilling Practices Under Present Conditions

B. J. DOWD, Production Engineer, Union Producing Co., Shreveport.

TO meet the demands placed upon the oil industry for exploration and development of additional petroleum reserves, drilling contractors are being called upon for greater service than ever before. In this they have two main obligations: (1) Use of adequate equipment, and (2) use of skilled workmen who will employ such methods as will result in safe, economical and rapid completion of wells.

Contractors have redoubled efforts to take care of existing equipment. Some of the practices generally observed include: (1) Keep rigs painted when running and when stacked; (2) when rigs are stacked, keep crank cases of engines and fluid and steam ends of pumps filled with oil; (3) keep boilers painted and swab flues and fire boxes with oil, and (4) keep boilers full of water up into nipple connected to steam outlet to prevent internal corrosion.

Drill pipe is being made to run longer by means of: (1) Regular inspection internally with the tuboscope; (2) regular inspection externally with micrometers; (3) culling bad joints and repairing others, and (4) rebuilding unreplaceable old tool joints. For this, various methods of applying tungsten carbide and other hard-facing materials are being developed.

Good practice calls for keeping several good joints of drill pipe above drill collars, and changing around so as not to run the same joint in the same position too long. Drill collars must be inspected repeatedly to find hidden fatigue cracks. Collars and subs should be rethreaded regularly. Joints must be made up carefully, using a good compound.

Draw works, pumps, rotaries, engines and other such surface equipment can be kept patched up and used but wells cannot be drilled without good drill pipe, tool joints, drill collars and rock bits.

A blowout is one of the greatest fears of a contractor. The most important factor in prevention of blowouts is proper conditioning of drilling mud. Principal objectives in mud treatment are to reduce viscosity, release occluded gas, remove cuttings, obtain sufficient hydrostatic head to prevent blowouts and obtain more pumpable fluid.

Filtration of water into surrounding formations is partly responsible for stuck drill pipe, poor cement jobs, oversize holes and heaving shale. Various mud materials and chemicals being provided to overcome difficulties of treating mud, and effective methods are being developed to facilitate mud control.

In addition to poor mud, causes of blowouts are (1) material failure, (2) poor judgment, (3) lack of skill in operating equipment, and (4) improper maintenance of equipment.

Top control equipment is not effective unless casing is in good condition. Chief causes of excessive wear on casing are (a) crooked kellys and (b) eccentric motion of rotaries. Most pronounced wear on casing usually occurs from 100 to 200 ft. below the surface. Use of drill pipe protectors helps prevent casing wear.

Accurate well measurements are important for successful well completions. For this the following precautions are essential: (1) Inventory of the number of joints on hand should be made. Identification of each joint should be chalked on pipe as measured, and entered on tally sheet; (2) all measurements should be checked before pipe goes into the ground; (3) pipe should be measured in and out of the hole at regular intervals.

Good cement jobs are particularly important in case of multiple completions, for future workovers, when sands are thin, for seclusion of salt water in upper sands and control of gas-oil ratios and to seal each vertical foot.

Caliper logging is a great help in determining amount of cement needed as the hole usually is larger than bit size because of washing out, etc.

Contractors have been handicapped in their efforts to provide skilled workmen but have done the best they could under the conditions.

Safety Practices in Rotary Drilling

R. C. SHARP, Petroleum Engineer, Los Angeles.

A STUDY of a safety program for drilling contractors has two phases, a mechanical side and a human side. The second, considers the obvious and practical steps which may be taken to promote safety of drilling crews. All the mechanical safeguards in the world are of no avail if the worker is not safety conscious.

Contract drilling presents many problems in safety not present in most industries. Too often, the companies have felt that they were too small, or that because of the many different conditions encountered, a safety program is impossible or unnecessary. Rewards of a safety program from a company standpoint are twofold. One, which is intangible, is better morale among the personnel, and the other, which is tangible, is dollars saved. Dollar savings come from reduced compensation insurance costs. (Operation of insurance companies and relation of accidents to insurance costs were discussed at length.)

Elements of a safety program from the human side are:

(1) Win the confidence, respect and interest of the workers. Impress them with the thought the program is for their benefit. Do not use disciplinary measures to enforce safety rules. Rules and regulations are necessary but men must know the reasons for the rules; (2) repetition in publicity work, and (3) workers must be impressed with the seriousness of the program.

Some phases of safety work from a mechanical side are: (1) Enclose all moving parts; (2) see that mechanical safeguards are installed and kept in service; (3) provide first-aid kits around drilling rigs and see that they are kept supplied; (4) have workers wear proper clothes, such as hard hats, hard-toe shoes, short gloves, goggles (when work occasions), etc.; (5) restrict smoking where hazards are involved; (6) keep hand tools in good condition; (7) provide safe stairways, walkways and ladders, and (8) provide safety belt, life-line, and belly-buster emergency exit line to the ground for the derrick man.

Water Drives in Illinois Pools

(Continued from page 94)

lowing data on the Patoka project:

"Felmont Corp. and Sohio Petroleum Corp. on July 1, 1943, were developing jointly a pilot water-flooding project in 21-4n-1e, 3rd P.M. in the Patoka field, Marion County, Illinois, to determine the feasibility of water flooding in this field. Nine new wells had been drilled to serve as water-intake wells, and the injection of water was started in October 1943. The pilot project, covering 60 acres, was developed on a five-spot pattern, with 660-ft. spacing between like wells.

"The above operators own, jointly, most of the productive area of the Patoka field, which covers about 700 acres, and if the pilot flood is successful they plan to water flood the entire field. Tentative plans call for drilling a total of 44 water-intake wells if the project is extended. From core analyses, recovery records, and past experiences, the operators estimate that the production by means of water flooding may approximate the quantity of oil that this field has produced to date. From the date of discovery (1937) to January 1, 1943, the field produced 2,325,000 bbl. of oil.

"Production is from the Benoist sand, which is at an average depth of 1,420 ft. and has an average thickness of 25 ft. The formation temperature and pressure were 80° F. and 30 p.s.i., respectively, at the time water injection was started. It is reported that under these conditions of temperature and pressure the oil has an absolute viscosity of 5.35 centipoises. The gravity of the oil is 38.6° A.P.I. at 60° F.

"From study cores the sand was found to have an average porosity between 19 and 20 per cent and to have an average oil saturation ranging from 50 to 55 per cent. The permeability of the sand averaged 150 md., and in streaks it is as high as 400 md.

"Water for flooding will be taken from a well completed in the Tar Springs."

Information on water-input volumes and present input-well development is not available, but one property in the pool that was averaging 142 bbl. per day before water injection (past production about 740,000 bbl.) is reported to have increased on oil production and to be making approximately 825 bbl. of oil per day in July 1944. Another lease previously making 66 bbl. per day (past production approximately 220,000 bbl.) is reported to have increased to 130 bbl. per day so far during 1944.

The Patoka water drive is significant on several counts, one being that the results so far indicate good prospects for the flood oil recovery to exceed substantially the primary recovery. Another is the 660-ft. input well spacing being employed. If this design should be used and similar water-flooding technique spread, it would amount to virtually the redrilling of such pools to provide an approximate 1:1 ratio between the oil and input wells.

In Illinois water-bearing sands above the producing formations are found in almost all fields. The depths and thickness of the water zones for the newer pools are accurately known from electric logs. It will be noted that such a water source is employed in the Patoka project. Some of the new fields, productive in the Chester sands, also are producing oil and large quantities of salt water from the Devonian, and there are well-merited possibilities to use this now "costly" water production as a recovery medium in the upper pays.

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TABLE 3—BARRELS OF OIL PRODUCED BY WELLS AFFECTED BY WATER INJECTION IN THE CLAY CITY FIELD
(From U. S. Bureauof Mines, R.I. 3778)

Well—	To July 1942	July 1942	Aug. 1942	Sept. 1942	Oct. 1942	Nov. 1942	Dec. 1942	Jan. 1943	Feb. 1943	Mar. 1943	Apr. 1943	May 1943	June 1943
Water injection into Clay City Banking Co. A-8:													
Clay City Banking Co. A-8	84,026	181	170	88	Converted to water-injection well September 19, 1942								
Clay City Banking Co. A-1	107,412	136	147	148	129	134	197	258	258	315	281	303	259
Clay City Banking Co. A-5	79,060	175	180	173	178	183	238	354	933	1,321	1,000	1,067	887
Clay City Banking Co. A-7	95,213	179	189	180	187	191	830	1,649	821	239	121	107	107
Clay City Banking Co. A-11	84,176	397	397	389	349	299	349	1,498	494	Went to wtr. Not operated after February			
Clay City Banking Co. A-12	55,982	344	339	351	223	223	239	238	303	431	403	339	363
Holmes Consolidated 4	68,070	361	298	310	328	347	356	432	384	427	379	400	366
Total for group	573,939	1,773	1,720	1,639	1,394	1,377	2,209	4,429	3,193	2,733	2,184	2,216	1,982
Water injection into C. D. Duff A-3:													
C. D. Duff A-3	44,611	59	66	65	Converted to water-injection well September 29, 1942								
C. D. Duff A-1	64,595	105	93	114	124	120	124	116	169	468	340	7	573
C. D. Duff A-2	91,224	94	98	116	124	120	124	117	108	151	170	164	180
George L. Travis 1	205,339	240	188	180	172	172	160	179	162	138	159	152	194
George L. Travis 2	56,536	149	125	120	118	116	119	118	108	103	113	105	159
George L. Travis 3	51,518	240	190	179	172	172	156	179	161	137	159	163	196
George L. Travis 4	12,013	120	124	120	118	118	119	121	106	104	110	106	158
Zoa Mosely 1	66,557	152	157	148	155	150	70	151	121	373	188	305	373
Zoa Mosely 2	9,726	72	60	45	48	32	18	43	41	215	212	243	431
Bunyan Travis 3	118,529	213	217	208	216	203	206	310	661	422	216	329	394
Bunyan Travis 4	74,294	184	186	178	187	176	176	1,502	2,499	502	162	199	339
Total for group	794,942	1,628	1,504	1,473	1,434	1,379	1,272	2,836	4,136	2,613	1,829	1,773	2,997
Water injection into A. G. Stanford 4:													
A. G. Stanford 4	34,941	99	87	85	50	Converted to water-injection well October 16, 1942							
A. G. Stanford 2	78,831	76	66	90	61	60	61	2,599	1,769	100	204	22	95
A. G. Stanford 3	41,378	96	81	60	61	30	31	64	246	343	171	148	154
J. H. Holman 3	54,545	184	185	179	184	177	208	228	215	244	220	218	226
J. H. Holman 4	19,412	152	150	150	153	150	172	187	187	214	170	183	190
R. C. Hubble 1	11,170	62	62	60	61	34	35	69	177	338	97	71	39
R. C. Hubble 2	7,813	65	62	60	62	34	35	57	71	99	51	49	27
Total for group	248,090	734	693	684	632	485	542	3,204	2,665	1,429	913	691	731

PRACTICAL REFINERY ENGINEERING

No. 16—Economic Approach Temperature

by Paul Buthod and B. W. Whiteley

MODERN refining methods have placed an emphasis on the efficient utilization of heat. Perhaps to even a greater degree than in other industries, the efficiency of plant operation as measured by the dollar costs of products, is of utmost economic importance.

In modern heat-exchange systems, the fresh charging stock may flow countercurrent through a number of exchangers where it is heated by the overhead vapors, side streams and residual oil from the column. Not infrequently, the charging stock is even routed to remote places in the refinery where it is heated before going to the pipe still.

Such systems serve a dual purpose. Preheating the fresh charge stock results in substantial savings in investment and operation of the pipe still, and a large portion of the necessary expense for cooling products from the tower is eliminated. Obviously, it is neither practical nor possible to utilize 100 per cent of this waste heat. In fact, as the cold and hot streams approach the same temperature level, the required amount of heat transfer surface rapidly approaches infinity. The least temperature difference between the hot and cold streams is commonly called the approach temperature.

In actual practice the approach temperature may range from 10° to several hundred degrees. On the one hand, a large approach temperature may result in an economic loss due to the fact that waste heat is not being utilized. On the other hand, too close an approach temperature may result in excessive investment and operating costs due to the large amount of required exchanger surface. The profit resulting from the saving of additional heat may thus be completely overbalanced by the higher investment and operating costs.

Depending upon the economic factors involved, it is possible to determine the approach temperature which will result in the greatest amount of profit. This economic approach temperature for an average set of conditions has been worked out by Nelson[1], and an analytical solution is also available.

For most purposes, however, a graphical solution can be obtained rapidly and affords a visual picture of the factors which are involved.

The economic factors to be considered in the solution of this problem, are for the simple case: (1) Savings resulting from the utilization of waste heat; (2) investment costs in the heat exchanger system expressed in terms of a depreciation rate and interest on investment, and (3) operating costs incurred by the heat-exchange system.

The depreciation rate usually represents a book value and may vary from 1 to 5 years depending upon the accounting procedure. Most engineers prefer to use a high depreciation rate.

The economic approach temperature can be determined by calculating the heat-transfer rate at a series of approach temperatures, and computing the net profit from heat exchange for each of these conditions.

A graphical plot of such a computation is shown in Fig. 1, where the approach temperature is plotted against the resultant profit from heat exchange. From the chart, the maximum profit from heat savings will result at an approach temperature of approximately 43° F.

The calculations used in the construction of the chart are shown in the following illustration:

Example.—A 40° A.P.I. Mid-Continent crude oil charge to a tube still is used to cool a 32° A.P.I. gas oil side-draw product from a fractionating tower. The crude oil rate is 8,000 bbl. per day and the gas-oil rate is 3,000 bbl. per day. The crude enters the exchanger at 140° F. and the gas oil enters the exchanger at 530° F.

Tubular heat exchangers in series with the following dimensions are to be used:

I.d. of shell, 10 in.
Number of tubes, 76 (¾ in. 16 gage)
Length of tubes, 10 ft.
Baffle spacing, 4 in.

Pertinent cost data is as follows:
Cost of single exchanger, $600.
Annual upkeep and repair per exchanger, $200.
Interest rate, 5 per cent.
Depreciation period, 5 years.
Value of heat saved, $0.17 per million B.t.u. transferred.

Solution. — The average viscosity

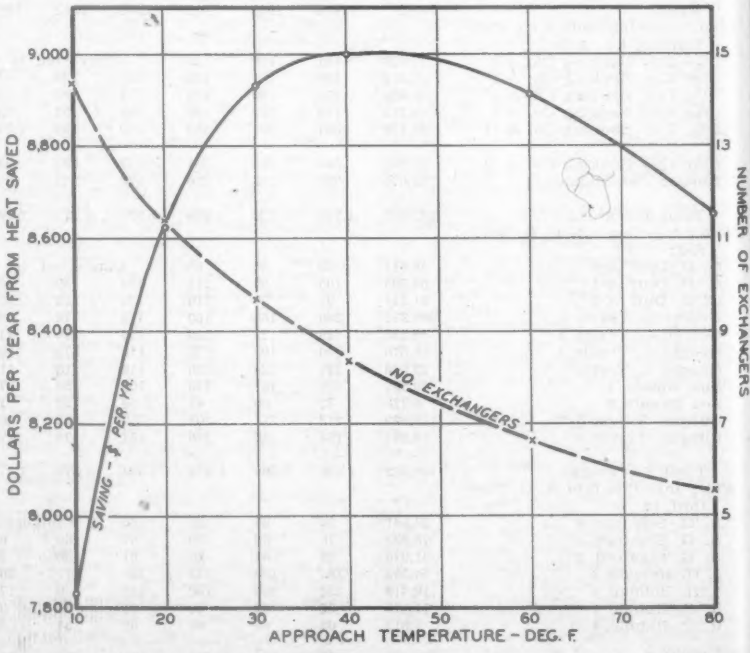


Fig. 1

and over-all heat-transfer coefficient will change slightly for different approach temperatures but for approximate purposes they can be regarded as constant. The average viscosity of the crude oil is about 1.3 centipoises and that of the gas oil about 1.1 centipoises.

Calculation of the over-all heat-transfer coefficient, with the crude oil flowing on the tube side, indicates a value of 71.5 B.t.u. per hr.-sq. ft.-°F. As a matter of interest, the over-all coefficient would be reduced to 59.0 if the crude oil was routed through the shell side. The heat transfer and resultant savings are calculated as follows:

Case 1. — Approach temperature, 80° F.:

The least temperature difference will exist at the inlet crude-oil side and since the inlet temperature of the crude is 140° F., the outlet gas-oil temperature will be 220° F.

From a heat balance (See No. 14 of this series), the amount of heat transferred is 7,280,000 B.t.u. per hour and the outlet oil temperature is found to be 279° F.

For this approach temperature the true mean-temperature difference is:

$$\Delta t = 149° \text{ F.}$$

The required heat transfer area is:

$A = 7{,}280{,}000/71.5 \times 149 = 684$ sq. ft.

The area of a single exchanger is 124 sq. ft. and the required number of exchangers is found to be 5.52. The fractional portion of the exchanger is carried for the purpose of plotting the curve.

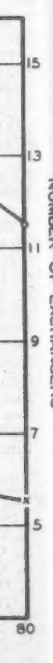
Calculation of cost data is as follows:

Cost of exchangers, $5.52 \times 600 = \$3{,}310$
Yearly depreciation + interest = $846
Oper. cost per yr., $5.52 \times 200 = \$1{,}104$
Value of heat saved, $7{,}280{,}000 \times 24 \times 360 \times 0.17/1{,}000{,}000 = \$10{,}700$.
Yearly operating profit, 10,700 — 1,104 — 846 = $8,650.

Calculations for other approach temperatures are performed as above. The results are shown in the following table.

Approach temp., °F.	Heat transferred B.t.u./hr.	Yearly oper'g profit	Required number of exchangers
80	7,280,000	$8,650	5.52
60	7,660,000	$8,910	6.60
40	8,160,000	$9,000	8.38
30	8,400,000	$8,934	9.62
20	8,620,000	$8,612	11.40
10	8,800,000	$7,836	14.40

The approach temperature is plotted against both the yearly operating profit and required number of exchangers as shown in Fig. 1. The economic approach temperature from the graph is found to be 43° F. and for this approach temperature, eight exchangers will be required.



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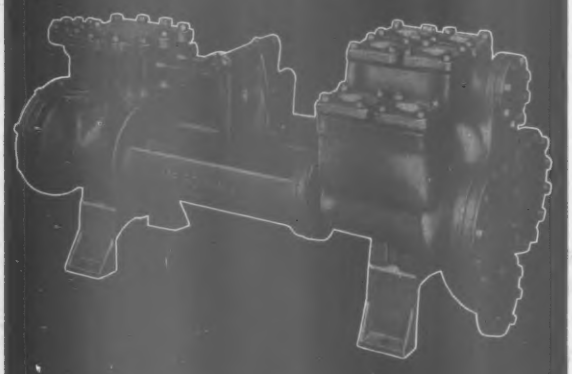

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Naphthenic Crude Oils

ALTHOUGH naphthenic or asphalt base crude oils have often been frowned upon in the past, this attitude is changing and very rapidly at the present time.

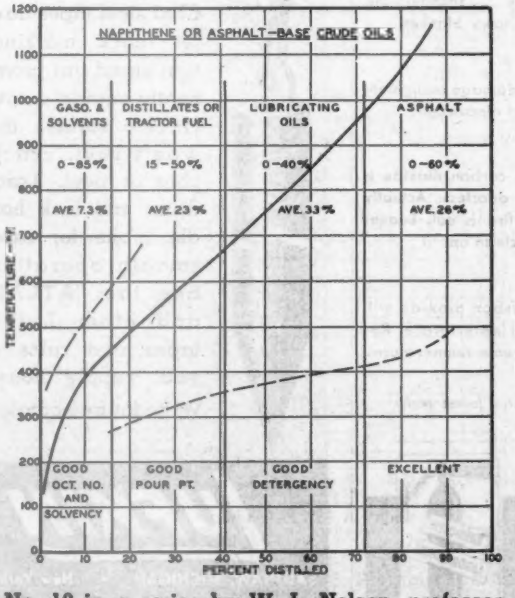
1. Gasolines have high-octane number.
2. Freedom from wax lessens cost of producing diesel fuels and lubricating oils.
3. Asphalt content may be high.
4. Lubricating oils are superior in engine-cleanliness qualities so that no other natural oils can be used for diesel engines.
5. Chemical treatment is relatively simple.

As against these advantages:

1. Sulfur content is often high.
2. Salt and sediment are often troublesome.
3. Gasoline content is low or entirely missing.
4. Lubricating oils have poor viscosity index.
5. Lubricating oils appear bad to public because of dark color.
7. Kerosene stock tends to smoke badly.

Gasoline.—Although many of these crude oils contain very little gasoline, certain oils, notably those of the Gulf Coast area, contain 20 to 35 per cent. The gasoline has a higher octane number than gasolines from any base of crude oil except a few oils that might be termed aromatic base. The octane number of 400-end-point gasoline ranges from about 55 to as high as 70. Lower boiling gasolines exhibit somewhat better octane numbers. In actual engine performance the gasolines behave somewhat better than the A.S.T.M. octane number would indicate.

Kerosene and tractor fuel.—The kerosene stock usually contains enough aromatic hydrocarbons to cause a tendency to smoke. Unless this material is sold to an inferior market such as the Orient, it must be chemically treated for the removal of aromatics by such processes as sulfur dioxide (Edeleanu) extraction or sulfuric acid. More frequently this material is sold as a superior tractor fuel oil, light stove distillate A.S.T.M. Nos. 1 or 2, or as a low-pour-point diesel fuel oil if its ignition qualities are satisfactory.



Lubricating oils.—Some of these oils contain no wax and hence the very expensive dewaxing operations are avoided. The cost of dewaxing often constitutes nearly half of the cost of manufacture. Vacuum distillation is widely employed and this produces light-colored lubricating oils which can be treated with ease.

These oils have a poor viscosity index, but select crude oils yield oils having an index of 30 to 55. This means that the oils become very thick or viscous at low temperatures, so viscous that they cannot be used in the winter (below about 25° F.). Loss of viscosity at high temperatures is seldom of practical significance.

No other oils exhibit the detergency or cleaning qualities of the naphthenic-base lubricating oils. They cause less carbon deposition than other oils, even tending to clean a dirty engine and such carbon deposits as occur are not gritty or firmly attached to the engine parts. For this reason they are widely used for heavy-duty or diesel-type engines. The oils act as cleaning agents because they keep the carbonaceous or sludge-like materials in suspension and hence they tend to become dark in color, a quality which works strongly against them because the public believes in clear, clean-looking lubricating oils.

Asphalts, fuel oils or cracking stock.—Naphthenic topped crude oil is usually cracked into gasoline. The yields are somewhat low because of the relatively low gravity of these oils and difficulty with corrosion is encountered with many of these oils because of their high sulfur content.

Many of these oils contain large amounts of asphalt and the quality of the asphalt is excellent particularly with respect to its ductility. A combination of asphalt manufacture and lubricating-oil manufacture by using vacuum distillation is highly profitable.

Yields.—Crude-oil gravities are low but the highest-gravity crude oils contain large amounts of gasoline. Yields of 410-425 end-point gasoline from different gravities of crude oil are:

	Per cent
15 A.P.I. crude	0-10
20 A.P.I. crude	10-25
30 A.P.I. crude	30-60

Only about 10 per cent of our crude-oil production is of naphthene base, but in 1927 it constituted about 24 per cent. Sulfur may range from 0.12 to over 4 per cent, gasoline content ranges from none to over 85 per cent, and gravity ranges from 12° to over 50°.

No. 13 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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CARBON DIOXIDE
FIRE EXTINGUISHER

Few people think about fighting a fire until they actually face one. That's why it's important that every fire extinguisher operates *easily—quickly—thoroughly!*

Randolph "4" simplifies, speeds fire-fighting. This modern extinguisher with the "breath of ice" chokes gasoline, oil, paint, machine, electric fires—instantly. Hits the blaze before damage is done!

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Mobilize against fire with Randolph carbon dioxide protection. For complete details and prompt service, call your supply house, or write us—today.

ONE-HAND ACTION!

Easy! So obvious and easy . . . any employee can use it. No valves or hoses to twist—no horns to raise!

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Efficient! Carbon dioxide will not deteriorate. Remains effective in extreme temperatures.

SEND NOW *for free booklet "Sharpshooting at Flames." Illustrates latest techniques in carbon dioxide fire fighting.* NAME_____

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A FEATURE OF THE OIL AND GAS JOURNAL

FORMATION OF OIL

OIL originates in organic sediments within the earth known as source rocks or source beds. Professor Marzec, of the University of Bucharest, was the first geologist to describe source rocks of petroleum adequately and to point out their importance. He termed them "mother rocks of petroleum" and defined them as the rocks in which the organic material has been placed by sedimentation and in which are formed the hydrocarbons that comprise the oil deposits. Source beds are fine textured, thinly bedded, thinly laminated, and fairly uniform throughout a considerable extent. The color is usually dark, although it may change to light gray or brown upon weathering. The beds are distinctly organic. The organic remains are minute and finely dissiminated throughout the mass in such a way as to be unrecognizable except through a microscope. Larger fossils are rare. Minute forms such as algae and diatoms are present generally and less commonly foraminifera and astracods. Plant spore material and carbonaceous detritus are common constituents. Of the very minute material, plant remains predominate. When heated, considerable oil and tarry matter can be distilled out of the material. When fresh samples are obtained from wells, sometimes the chloroform test will show a slight test for crude oil.

Genesis of petroleum. — Many theoretical explanations have been advanced and much experimental work done on the genesis of crude oil out of the primary organic material in the clays, muds, and calcareous oozes. Oil is thought to be formed by a combination of complicated and by no means well-understood chemical and physical reactions. The steps in the process which are the most important are something as follows: (1) Work of bacteria in the muds and oozes; (2) action of chemicals and catalytic agents in the breaking down of complex organic molecules derived from plants into simpler, less complex molecules, and (3) thermal and pressure effects brought about by deep burial earth movements and subsurface temperatures which further break down the complex molecules.

Organic matter is deposited in shallow water. Bacteria are present everywhere in swamps and lagoons. Their chief action seems to be to attack the walls and cell tissue of the newly buried plants, to decompose cellulose into humic acid, and to set free lignin, waxes, and other colloids. The colloids are fatty or oily acids of a complex nature somewhat similar to humic and lactic acid but more complex. These complex compounds probably remain intimately mixed with slimy colloidal clay as part of the sediments until deeply buried and acted upon by subsurface heat and pressure.

Salts and alkalies from the water in the sediments may react with the organic acids forming saponification products known as alkaline salts of the acids and bring about changes so that less heat is required to decompose the colloidal substances. For example stearic acid, $C_{18}H_{36}O_2$, plus a sodium alkali forms sodium stearate. These fatty salts in the presence of reducing agents such as the finely divided carbonaceous matter in the clay when heated loose O_2 forming CO_2 and CH_4. These gases are squeezed out and move into porous layers or may escape through open joints in the clays. A bituminous residue in the form of a solid or semisolid hydrocarbon may be left behind. This semisolid hydrocarbon probably stays in the sediments for a long time until the layer is buried deep enough so that temperature is increased enough and pressure of sediments above is sufficient to crack it and change it into a lighter compound which eventually becomes a hydrocarbon gas and unites with other molecules of gas already pressed out of the clay to form a liquid, and finally a complex mixture of liquids and gases known as crude oil.

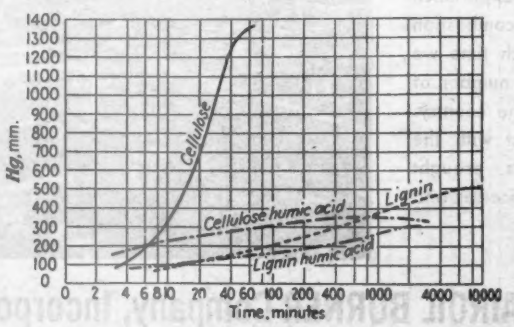


Fig. 1—Heat instability of carbohydrates and lignin

Decomposition Temperature

Laboratory experiments indicate that it requires temperatures of 175° to 250° C. or more to decompose carbohydrates. But changes may take place at lower temperatures if given sufficient time, as shown by Berl, Fig. 1. In nature, however, since the distillation reaction is exothermic, it is possible that once the decomposition has started that temperatures may be automatically raised which will carry the reaction to completion. Exothermic means a chemical change which in going forward gives out heat.

The addition of external heat caused by folding or shearing or compacting of the strata, due to deep burial, would accelerate the process and such movements might be necessary to start the process.

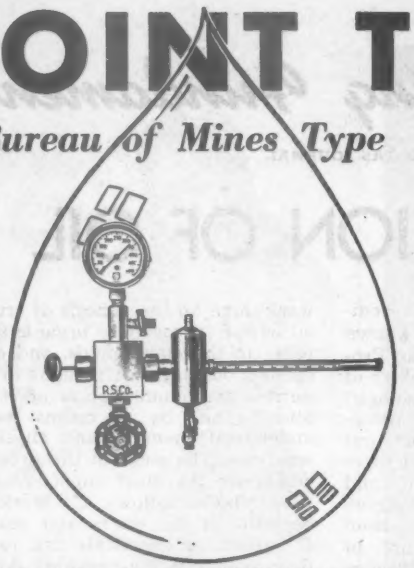
There is no doubt that pressure plays an important role in determining the nature of the final end product formed in petroleum synthesis for the following reasons: (1) Increase in pressure enables reactions to go on at a lower temperature and hence pressure facilitates thermal reactions; (2) thermal reactions under pressure result in the formation of small hydrocarbon molecules, hence lighter oils and more gas; (3) differential pressures, the result of compacting, etc., move the liquid and gas hydrocarbons about and help to bring them in contact with other hydrocarbon droplets and other mineral and chemical substances with which they react, combine, and finally form a deposit of petroleum.

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

DEW-POINT TESTER

Bureau of Mines Type

- **Designed primarily for use in connection with high pressure gas transmission lines.**
- **Determines dew-point of gases under conditions of pressure as they are found to exist.**



- **Accurate within 0.2° F.**
- **Standard range 0 to 600 P. S. I.**
- **High Pressure range to 2,500 P. S. I.**
- **Easy to operate and easily adjusted.**

This unit sold complete with hardwood carrying case, adjustable field tripod, copper tubing and necessary fittings.

THE REFINERY SUPPLY CO.

Main Office and Plant

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MORE days per run

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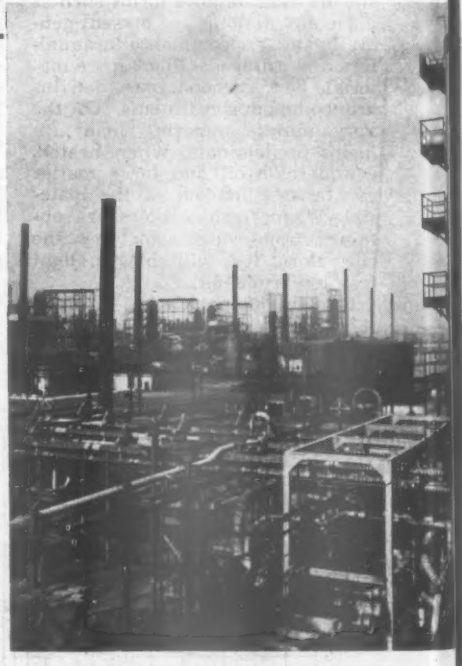

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ACCESS DOORS • AIR DOORS • BURNER BLOCKS • FURNACE OBSERVATION WINDOWS

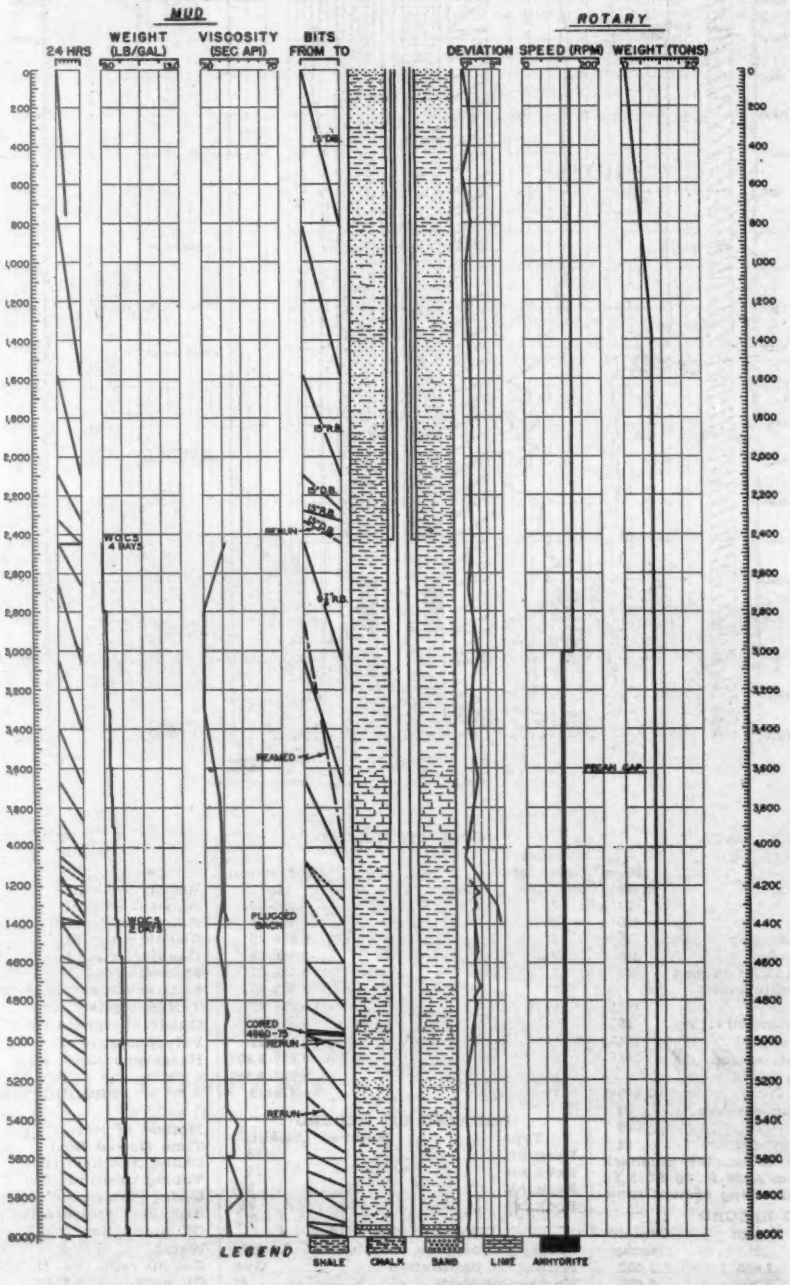
Journalog

No. 66

Discovery Well, South Tyler Pool, Smith County, Texas

PHILLIPS PETROLEUM CO. 1 McMINN
M. M. Long Survey. Elevation 478 ft.

CONTRACTOR
Delta Drilling Co.



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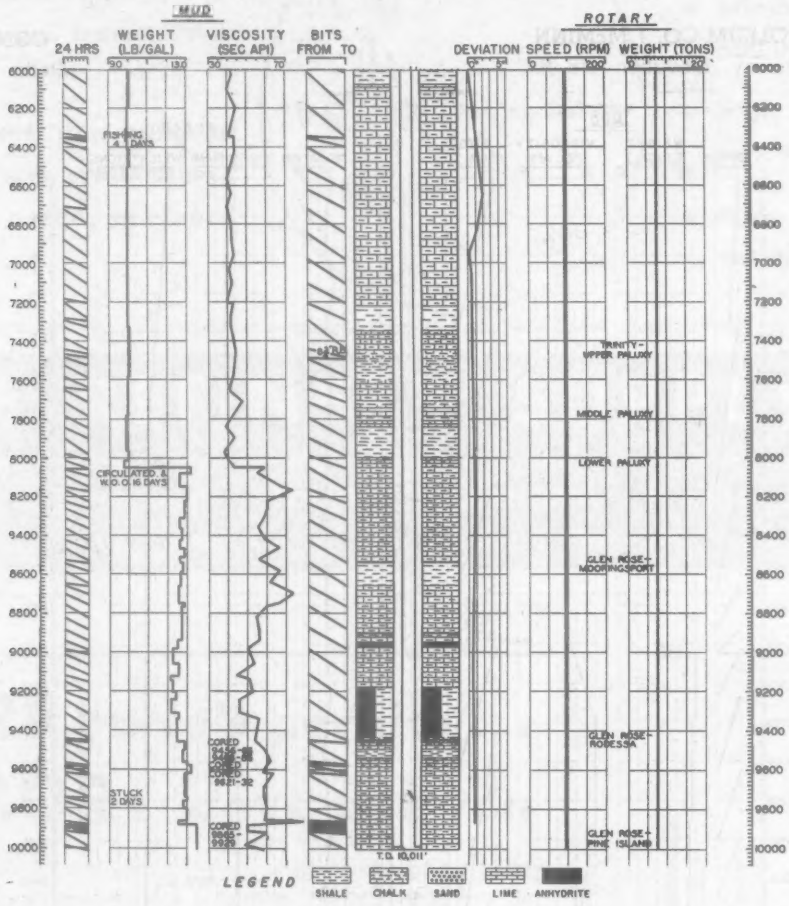
Journalog

Discovery Well, South Tyler Pool, Smith County, Texas (Continued)



DRILLING DATA
(Rotary rig)

Time record:	Hours
Drilling and reaming	2,089¼
Coring	21¼
Trips	430¼
Well surveys and logging	26½
Fishing and stuck pipe	347
Circulating and conditioning mud	462
Running surface casing and W.O.C.*	148½
Running and cementing oil string	38¾
Shut down for repairs	104¾
Shut down for misc. reasons	225¼
Total	3,893½
Number electric log surveys	3
Deviation surveys	55
Number cores	12

*W.O.C. includes 40 hr. for plugback job (150 sacks) from 4,396 ft. to 4,095 ft. Does not include oil string cement time.

CASING RECORD

Size (in.)	Depth (ft.)	Cement (sacks)
10¾	2,436	1,400
5½	9,999	2,000

CORE BIT RECORD

Size core head (in.)	Core depth (ft.)
7	4,960-75
7	9,456-66
6¾	9,568-80
6½	9,580-96
7	9,621-32
7	9,865-76
6¾	9,876-82
6¼	9,882-89
7	9,889-97
6¾	9,897-9,907
6¾	9,907-9,917
7	9,918-29

DRILLING BIT RECORD

Type—	Number	Size (in.)
Drag bit	3	15
Rock bit	2	15
Rock bit	30	9⅞
Rock bit	29	8¾

COMPLETION DATA

Casing perforations (depth, ft.)	9,918-29
Method of perforation	Gun
Number of shots	42

MUD USED

Type—	Amount
Baroid (sacks)	11,602
Aquagel (sacks)	791
Anhydrox (sacks)	77
Caustic soda (lb.)	2,048
Quebracho (lb.)	1,453
Stabalite (lb.)	2,201
Soda acid phosphate (lb.)	265
Tetraphosphate (lb.)	5,675
Quadraphosphate (lb.)	7,625
Polyphosphate (lb.)	350
Haegerphosphate (lb.)	550

PRODUCTION TEST

Method of test	Flowing
Time flowed (hr.)	12½
Choke (positive) (in.)	⅛
Tubing pressure (lb.)	4,600
Casing pressure	Closed
Separator pressure (lb.)	500
Oil production (bbl.)	95
Water	None
Gas-oil ratio (cu. ft./bbl.)	2,800
Oil gravity (°A.P.I.)	40

Small size with BIG OUTPUT

THE NEW "Oilwell" No. 8-P Duplex Power Pump is designed for use where short over-all dimensions are desired. Its outstanding feature is large volume and high pressure output in relation to size and weight.

Two No. 8-P pumps can be mounted side by side on a truck body without exceeding 8-foot road clearance limits.

The No. 8-P is regularly equipped for slush pump service but suitable pistons and special valves can be furnished for pumping clear water, oil or other fluids.

FEATURES

1. One-piece rib-reinforced cast power frame designed for rigidity and accessibility.
2. Fully heat-treated single-helical gears.
3. Shim-adjusted tapered roller bearings.
4. Eccentric drive with full-floating bushings.
5. Combination oilbath and splash lubrication.
6. Flexible baffles on piston rods prevent mud or water from entering power end.
7. One-piece direct-flow fluid end assures efficiency at all operating speeds.
8. Removable liners.
9. Right or left-hand drive—pinion shaft can be reversed without disturbing main gear.

SPECIFICATIONS

Size, Bore x Stroke (Duplex)	inches	5 x 8
Liner Sizes	inches	4, 4½, 5
Rated Speed	r.p.m.	80
Recommended Brake Horsepower at Rated Speed		76
Theoretical Displacement (Piston Rods Deducted with Full-Size Liners at Rated Speed	g.p.m.	206
Maximum Working Pressure with Full-Size Liners	lbs. per sq. in.	540
Rated Fluid-Chamber Pressures: Suction	lbs. per sq. in.	900
Discharge	lbs. per sq. in.	1,800
Over-all Length (including Steel Skids)		8′ 10″
Over-all Length (less Skids)		8′ 0″
Over-all Width (including Pinion Shaft Extension)		3′ 2″
Over-all Height (including Steel Skids)		3′ 2½″
Weight Mounted on Wood Skids: Domestic	pounds	5,050
Export	pounds	5,425

Send for additional information

THE NEW "Oilwell" No. 8-P (5" x 8") POWER SLUSH PUMP

OIL WELL SUPPLY COMPANY

Executive Office — Dallas, Texas
Division Offices—Columbus, Ohio
Dallas, Texas Los Angeles, Calif.

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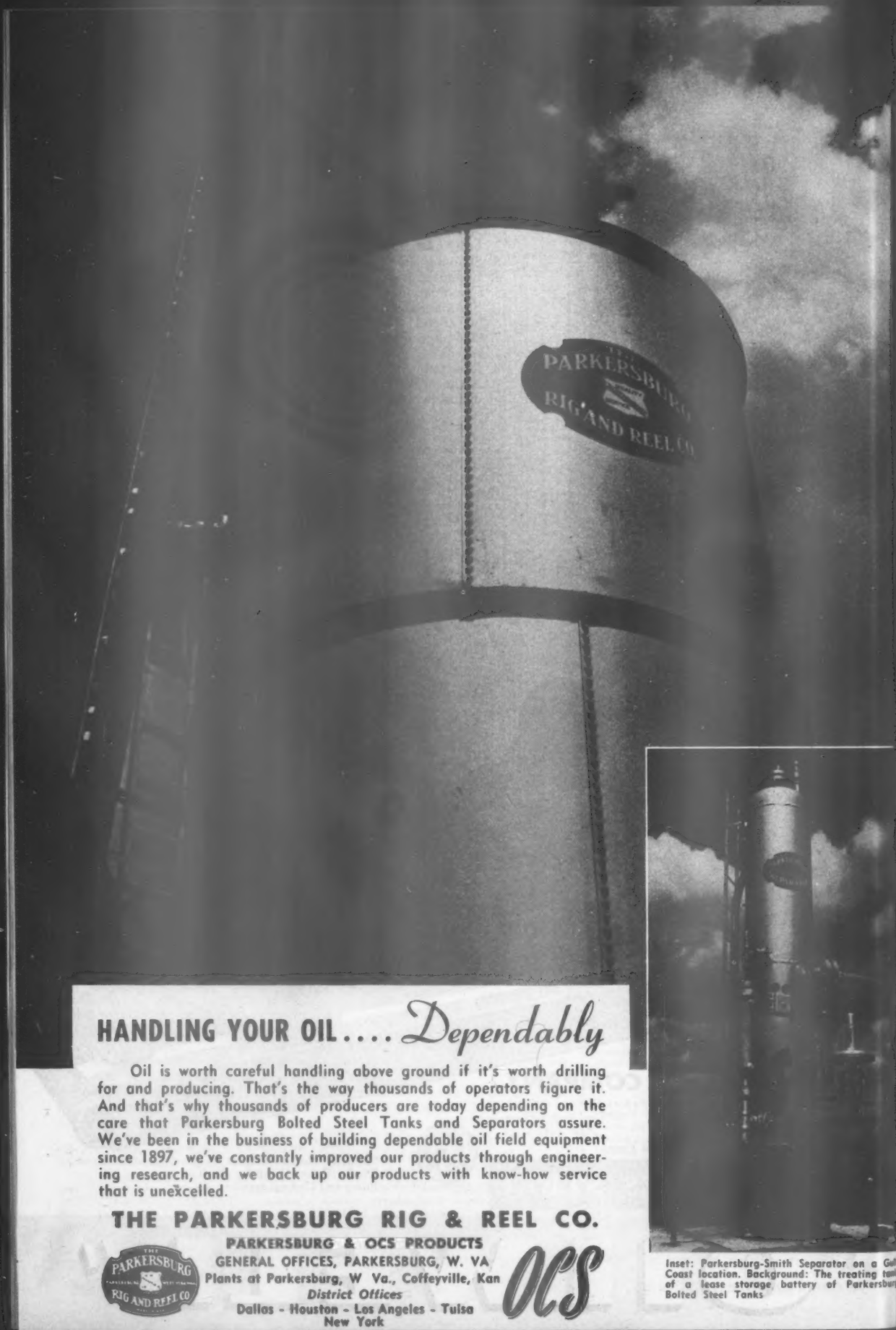
UNITED STATES STEEL

"Oilwell" No. 8-P (5" x 8") Duplex Power Pump for Slush Pump and General Service.

"OILWELL"



HANDLING YOUR OIL.... *Dependably*

Oil is worth careful handling above ground if it's worth drilling for and producing. That's the way thousands of operators figure it. And that's why thousands of producers are today depending on the care that Parkersburg Bolted Steel Tanks and Separators assure. We've been in the business of building dependable oil field equipment since 1897, we've constantly improved our products through engineering research, and we back up our products with know-how service that is unexcelled.

THE PARKERSBURG RIG & REEL CO.

PARKERSBURG & OCS PRODUCTS

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Plants at Parkersburg, W Va., Coffeyville, Kan

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Inset: Parkersburg-Smith Separator on a Gulf Coast location. Background: The treating tank of a lease storage battery of Parkersburg Bolted Steel Tanks

Natural Gas

J. French Robinson Made President of A.G.A.

NEW YORK. — J. French Robinson, president of East Ohio Gas Co., Cleveland, Ohio, was elected president of American Gas Association at the annual business meeting here last week, assuming the duties of the office at once. In conformity with the Government's request for curtailment of travel, the usual convention was dispensed with this year, Robinson, who became president of the East Ohio company 4 years ago, formerly was president of Peoples Natural Gas Co., Pittsburgh, an affiliate. Both are now parts of Consolidated Natural Gas Co.

As a boy Robinson assisted his father in the operation of a gas plant in West Virginia, where he was born. He is a graduate of West Virginia University in civil engineering. For several years he followed geology as a profession in connection with engineering. He was first associated with Peoples Natural as geologist and engineer. In 1933 he was elected vice president, becoming its president in 1936.

Robinson is a member of Petroleum Industry War Council and chairman of the natural gas and natural gasoline committee of Petroleum Administration for War.

Says Gas Reserves Will Last for Next 45 Years

WASHINGTON. — Gas reserves big enough to supply consumer needs for the next 45 years are available, according to Huffman Lewis, of Houston, counsel for the United Gas Corp., testifying before Federal Power Commission last week at the hearing on an application for a new contract to export natural gas from Texas to Mexico for distribution in the city of Nuevo Laredo and vicinity. "No part of Texas" or the rest of the United States "can be hurt by this exportation," Lewis declared.

The company has negotiated a new agreement with Compania de Gas Neuvo Laredo, and proposes to replace a portion of its 4-in. pipe line from Laredo, Tex., to the border with a 6-in. line in order to deliver increased quantities of gas to customers of the Mexican company. United Gas Corp. contends that only a small additional volume of gas will be taken from the Texas fields.

Court Grants Injunction in Butane-Law Test Case

AUSTIN.—District Judge J. Harris Gardner granted a permanent injunction last week against W. M. Foster, operator of a butane-gas servicing station in Marshall, in a test suit brought by the Texas Railroad Commission under the Liquefied Petroleum Gas Act. Judge Gardner overruled Foster's contention that the law does not allow for any injunctive penalty but intended that the railroad commission should impose penalties after hearing. The injunction prohibits sale, installation or servicing of butane equipment which has not been approved by the commission.

The commission asked the court to enjoin Foster from installing unapproved tanks or other equipment. Although the law was passed in 1937, Preston D. Craig, assistant director of the gas utilities division, said little difficulty was encountered regarding butane containers until the war made metal scarce for civilian usage.

Two other cases against butane-servicing companies are pending in Judge Gardner's court. Craig said that the commission is conducting other investigations.

Consolidated Gas Utilities Wants Added Facilities

WASHINGTON. — Federal Power Commission will hold a hearing October 20 in Kansas City, Mo., on applications of Consolidated Gas Utilities Corp., of Oklahoma City, for authority (1) to construct and operate an additional 400-hp. compressor unit and appurtenant equipment, at its Pitsch compressor station in Wheeler County, Texas, and (2) to construct and operate 2½ miles of 6⅝-in. pipe line in Cowley County, Kansas, to connect with the company's existing double 6-in. line, together with a measuring station and other appurtenant equipment.

Hero Medal for Employe of Pacific Gas & Electric

NEW YORK. — Michael Keane, a fitter employed in the gas department of Pacific Gas & Electric Co., in San Francisco, was awarded the American Gas Association Meritorious Service Medal here last week. The presentation was made by the association's president, Ernest R. Acker. In Keane's absence, the medal was received in his behalf by R. E. Fisher, a vice president of the company. The citation said that last March 23 Keane and his foreman answered an alarm for fire in a refinery at Oakland, Calif. It was unsafe to cut the gas service at the main because of flaming oil over the street. In trying to turn off the gas supply a fireman broke the valve. Keane donned an asbestos suit and, with water playing around him, closed the valve, thereby putting out gas burning at the base of a drum containing 4,000 gal. of oil, preventing its spread and probable explosion and "undoubtedly saving human lives and property."

FPC Disallows Proposed Increase in Cabot Rates

WASHINGTON.—Federal Power Commission last week issued an order disallowing the proposed higher rates, suspended by the commission last February, for natural gas sold by Godfrey L. Cabot, Inc., to its wholly owned subsidiary, Cabot Gas Corp., and resold to Pavilion Natural Gas Co. and Producers Gas Co. and directing that present rates shall remain in effect until further FPC order.

Cabot, Inc., the opinion states, proposed to increase its rates to Cabot Corp. from 7 cents to 25 cents per 1,000 cu. ft. and the latter, in turn, proposed to increase its rates to Pavilion from 40 cents to 55 cents. These increases, based on 1943 sales, would have increased the gross revenues of Cabot Corp. by $30,177.45.

"In this proceeding," the opinion points out, "we are not called upon to determine what will be reasonable rates for an indefinite period in the future, but whether, on the basis of present operations, the increased rates are warranted."

From The Field of Plastics Comes Corrosion Resistance For All Metal Surfaces...

TUBE-KOTE

The protective powers of plastics can now be utilized in many new ways by the oil industry. Through the process developed by TUBE-KOTE, Inc., and with the establishment of a plant in Houston, facilities are now available for a complete internal and external tubular plastic coating service . . . also available are facilities for plastic coating most types of metal and steel products.

"TUBE-KOTING" HAS THE FOLLOWING PHYSICAL CHARACTERISTICS:

1. Excellent adhesion to metal surfaces
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TUBE-KOTE, INC.

Patents Pending.

2520 HOLMES RD. **P. O. BOX 1822**
HOUSTON, TEXAS

REFINING

New Celanese Unit Will Make Butadiene Only

CORPUS CHRISTI. — A second plant, capable of producing 10,000 tons of butadiene annually for manufacture of synthetic rubber, has been started at Bishop, near here, by Celanese Corp. of America. The first plant, costing $5,000,000 and now nearing completion, is designed by Celanese for production of a wide range of chemicals. The new one will be devoted exclusively to butadiene. Reports from the office of the rubber director indicate the Celanese process will produce butadiene at low cost.

The method, worked out by specialists before Pearl Harbor, is said to be a development of the so-called Aldol process, which originated in Germany about 25 years ago. Either petroleum or alcohol can be used as the raw material. The new unit has been granted high priorities, and it is expected to be completed before the middle of 1945.

The company, which is branching out into plastics and chemicals from its original textile field, announced that both plants at Bishop are being constructed for the commercial application of processes developed by Celanese research specialists and chemical engineers operating under the direction of Joseph E. Bludworth, a native of Texas, who has been spending much time supervising installations in this state.

As the Baruch report to President Roosevelt recommended that future butadiene plant construction be limited to processes offering definite improvements over present installations, approval of the new plant at Bishop makes it apparent the Celanese process falls in this category. It is likely that Gasoline Plant Construction Co. of Houston will continue plant installations at Bishop as it has the contract for the chemical unit. M. H. Kotzebue, president of the Houston company, this year received the Hanlon award, highest honor in the natural-gas industry, for outstanding engineering achievement in that field.

Continental Workers Again Choose Independent Union

PONCA CITY, Okla. — Independent Oil Workers Union defeated Oil Workers International Union (C.I.O.) by a vote of 428 to 412 in a runoff election held last week by the refinery employes of Continental Oil Co. to determine the collective bargaining agency. At an earlier election, held by order of National Labor Relations Board, the independent union won 488 to 462, but the election was canceled by NLRB and a runoff ordered.

Hearing in Humble Seizure Case Set for November 6

ATLANTA.—The question of whether a federal district court may restrain seizure of a war plant by the Government to prevent a labor controversy from interrupting work will receive a hearing in Fort Worth on November 6 upon an order issued here last week by U. S. Circuit Court of Appeals. The case is the one involving Humble Oil & Refining Co. and War Labor Board.

The company, alleging the Government had threatened seizure of its Ingleside, Tex., refinery for noncompliance with a labor contract, obtained a temporary restraining order in federal court in Dallas against the Petroleum Administration for War and other government agencies.

The Government obtained an or-

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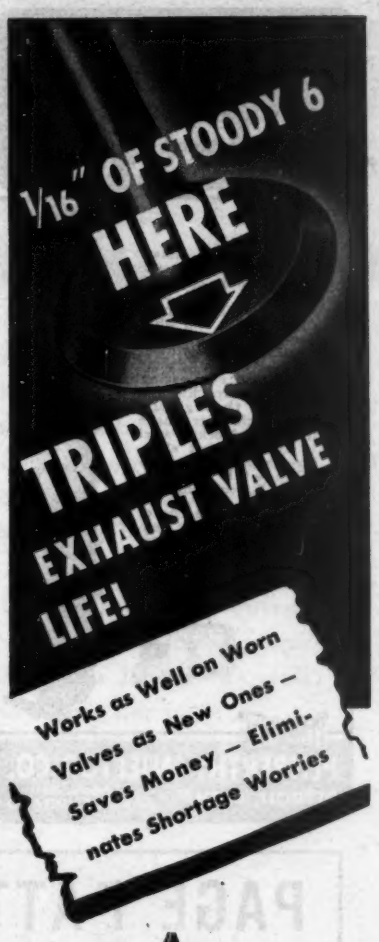
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HERE
TRIPLES
EXHAUST VALVE
LIFE!
Works as Well on Worn Valves as New Ones — Saves Money — Eliminates Shortage Worries

AN ounce or two of Stoody 6 welded to new or worn exhaust valve faces adds 300 to 400 percent to their normal life, prevents burning, saves overhaul jobs, costs only a few cents per valve.

This folder outlines the simple procedure any garage or shop equipped with acetylene welding equipment can follow. Eliminates your worries about valve replacements and saves money as well.

Write for folder "Weld New Life Onto Worn Valves With Stoody 6" — no obligation.

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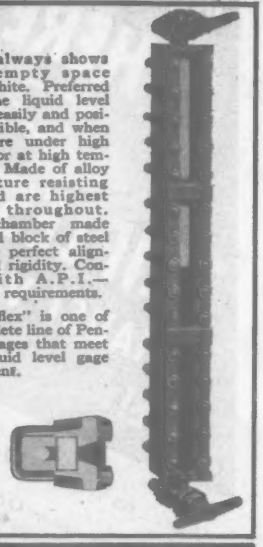
"REFLEX"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

der from Circuit Court Judge Edwin R. Holmes in Yazoo City, Miss., staying the district court order pending an appeal. The company then asked that Judge Holmes' order be vacated. The circuit court here set the case for hearing on its merits in Fort Worth.

Rex G. Baker, general counsel for Humble, said the trouble started when the company refused to include a maintenance-of-membership clause in a contract with a C.I.O. union and was ordered to accept the clause by the WLB. He said the company's action led to application of "sanctions and penalties" in the form of refusal by WLB to process wage adjustment applications.

John H. Crooker, Humble attorney, declared his company was "genuinely apprehensive" that the Government planned seizure of the plant. He said the company did not comply with the WLB order because it would "disrupt relations between the company and its employes."

Government attorneys denied that seizure of the plant was planned and said only President Roosevelt had the power to order such action.

East Coast Consumers of Fuel Oil Needn't Worry

WASHINGTON. — Consumers of fuel oil on the East Coast "will have no cause for worry" about the quality of home-heating oils next winter, according to Deputy Petroleum Administrator Ralph K. Davies. "A Petroleum Administration for War survey, backed by scientific research, clearly indicates that the burning qualities of home-heating fuel oil will be at least on a par with that of previous years when no serious difficulty was experienced," Davies said.

There has been discussion within the oil industry as to whether the quality of distillate fuel oil produced by catalytic cracking is as good as a thermally cracked or straightrun fuel oil. Some argued that the catalytic processes might produce an inferior fuel.

Month's Asphalt Demand Is Heaviest in Years

WASHINGTON. — Indicated demand for 820,000 short tons of asphalt in July was the heaviest in years. Production underwent little change, according to Bureau of Mines figures. Stocks were reduced 109,000 tons, leaving total inventories at the close of the month at 735,000 tons. The decline in stocks was about 15 per cent of the demand.

July demand was about 10 per cent higher than that of July 1943, and it compared with demand of 735,600 tons in June 1944. July production was 711,600 short tons, against 674,000 in June and 690,700 in June 1944.

The bureau reported domestic demand for road oil in July was 220,000 bbl., compared with 294,000 in July 1943, a drop of about 28 per cent. Demand in June 1944 was 211,000 bbl.

July production of road oil totaled 202,000 bbl., against 98,000 in July 1943 and 282,000 in June 1944. Stocks July 31, 1944, were 286,000 bbl. against 304,000 June 30, and 340,000 on July 31, 1943.

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The Reed inter-changeable Mud Nozzle eliminates the necessity of ordering new bits when it is desired to use a different jetting action than that provided in the bits available on the rig. Various sizes of jets may be had to accommodate any circulation requirements and the change can be made on the rig in a few minutes. Where desirable the nozzle may be left out entirely without impairing the strength or safety of the bit.

The construction of Reed Rock Bits provides a strong, safe foundation for the cutter assembly and all cutter teeth and gauge bevels are hard faced for longer life, full gauge hole and more hole per bit.

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SIX JET NOZZLE

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The two ditcher teeth pictured above were used on the same machine and operated under identical conditions.
The unprotected tooth at the top had to be sharpened every three days and was too short for further service after six sharpenings.
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Before the tooth was finally worn out, it had operated a total of 120 days!
Tube Borium makes such savings possible because the deposits represent the ultimate in wear resistance and the ability to cut hard earth formations.

*Stoody Tube Borium is supplied in rods of ⅛", 5/32", ¼" and 3/16" diameters and is available for either oxyacetylene or D.C. electric application. Prices and specifications are yours for the asking.

These tungsten carbide particles do not melt when tube is applied but are held in suspension in a mild steel matrix forming a deposit resembling coarse sandpaper.

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PIPE LINES

Cities Service Awards Gas-Line Looping Job

Sharman & Allen was awarded Cities Service Gas Co.'s contract last week for laying 50 miles of 16-in. line from Shidler, Okla., to Caney, Kans., to loop an existing natural-gas system. Work will start November 8. Contractors' headquarters are to be established at Pawhuska, Okla., under Earl Norris, spread superintendent. New A. O. Smith pipe is to be used.

Sharman & Allen completed last week 50 miles of 4-in., 8-in., 12-in. and 16-in. for Interstate Natural Gas Co. near Bastrop, La. The contracting firm is starting to lay 18-in. near Houston for United Gas Pipe Line Co.

Utah Refining Seeks to Build Colorado Line

DENVER.—The Rangely field in Rio Blanco County, Colorado, which has been proven for large production in the Weber formation of Pennsylvanian age in three wells, two of which are recent completions, will soon be provided with pipe-line facilities for the transportation of the crude. The Utah Oil Refining Co., which is building a line from Craig, Colo., to Wamsutter, Wyo., where it will connect with its line from eastern Wyoming to Salt Lake City, has applied to the Colorado Public Utilities Commission for a certificate authorizing it to construct a 90-mile 6-in. line from Rangely to Craig with a capacity of 6,250 bbl. daily, which will cost approximtaely $943,000. In connection with this program the company will acquire from the Stanolind Pipe Line its 19-mile 4-in. line from the Iles field to Craig, and will operate it as a part of the system.

When this program is completed the Utah Oil Refining Co., a subsidiary of Standard Oil Co. (Indiana) will have solved a major problem in the matter of supplying crude to its refinery at Salt Lake City. The company operates a 414-mile 8-in. line from Fort Laramie to Salt Lake City. At Fort Laramie it connects with the Stanolind trunk line from Wyoming to Freeport, Mo. Stanolind is now completing a 232-mile 12-in. line from the Elk Basin field to Casper, where it will have a connection with the trunk line to the East. This system will enable Utah Oil Refining Co. to draw crude not only from Lance Creek and other eastern and southern Wyoming fields but from the Big Horn basin fields. The Craig-Wamsutter line will provide transportation from the Iles field in Moffatt County, in which Stanolind is the principal operator, and the line from Rangely to Craig, which will tie in with the system, will open to it the new Rangely pool. Utah Oil Refining Co. is now transporting crude from Rangely to Salt Lake City in trucks.

A second line from Rangely to Craig is projected by Fred M. Manning, of Manning & Brown, Inc., and application for a permit has been filed with the state utilities commission. Details of the line were not specified in the application.

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AUTOMATIC ENGINE **CONTROLS**

Tennessee Gas Line Virtually Completed

River crossings and compressor stations on Tennessee Gas & Transmission Co.'s 1,265-mile natural-gas system from Texas to West Virginia are completed and only minor segments of the line remain to be laid.

Four spreads are laying 15 miles of 24-in. line this week in Kentucky and another spread is laying 5 miles in Tennessee. The five spreads are expected to complete the 20 miles of 24-in. this week, completing the only remaining gaps in the line.

Compressor units at all stations have been tested by preliminary runs of engines except at Stations 10 and 12.

Two Elk Hills Projects Reach Construction Stage

Substantial progress is being made on two of the three new pipe-line outlets programmed in California which will handle the increased production now being developed in the Elk Hills Naval Reserve.

Union Oil Co. of California has completed the survey and purchased right-of-way for the new 9-mile 8-in. line from Elk Hills to Midway station, near Taft, Calif. Casing for road crossings is being installed in order to expedite completion of the line when pipe arrives. Concrete foundations have been prepared and pumps, heaters and boilers have been installed thereon at Elk Hills station. Work has started on installation of suction line and connections to Standard Oil Co. of California's Buena Vista tanks.

Pipe for The Texas Co.'s new 61-mile 10-in. line from Elk Hills to connect with Valley Pipe Line Co. system in Kings County, was scheduled for rolling this week at the supplier's mill. Pipe is expected to arrive at the construction site before the month ends.

Ohio Progressing With Line-Stringing Work

Nineteen miles of pipe had been strung last week for Ohio Oil Co.'s 115-mile 8-in. products line from Robinson, Ill., to Indianapolis, Ind. All pipe for the line has been received. Twenty-three miles of right-of-way have been cleared, 14 miles of trench dug, 13 miles of pipe welded and 9 miles laid. About 7 miles of trench have been backfilled. The project is scheduled for completion in November.

Hearings Consolidated in Three Pipe-Line Cases

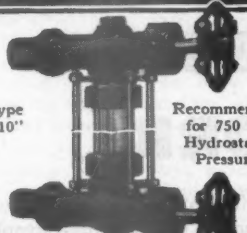
WASHINGTON. — Proceedings in which three gas companies seek authority to construct and operate facilities to connect with Tennessee Gas & Transmission Co.'s pipe line now under construction were consolidated by Federal Power Commission last week, and hearing was set for October 19.

Kentucky Natural asks authority to construct and operate about 18 miles of 16-in. pipe line extending from Russellville, Ky., in a southerly direction to a proposed point of interconnection with the Tennessee Gas & Transmission Co.'s line.

Louisville Gas & Electric wants to construct and operate (a) 62 miles of 8-in. and 3 miles of 12-in. pipe line beginning at the applicant's Cannons Lane mixing station at the city limits of Louisville, and extending in a southeasterly direction to a proposed point of interconnection with the Tennessee Gas & Transmission Co.'s line near Calvary, Ky., and (b) a crossconnection of 6-in. line, for emergency use only, between the applicant's existing 12-in. line and the Tennessee Gas & Transmission Co.'s 24-in. line.

Tennessee Natural Gas Lines, Inc., seeks to construct and operate about 17 miles of 10¾-in. pipe line beginning at a proposed point of connection with the Tennessee Gas & Transmission Co.'s line at Ashland City, Tenn.

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

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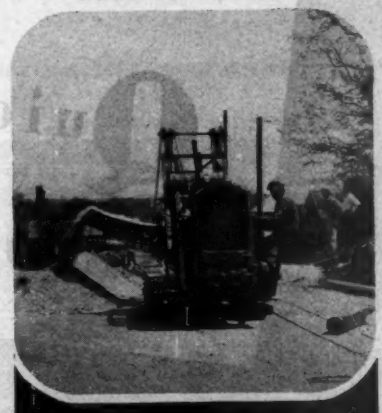

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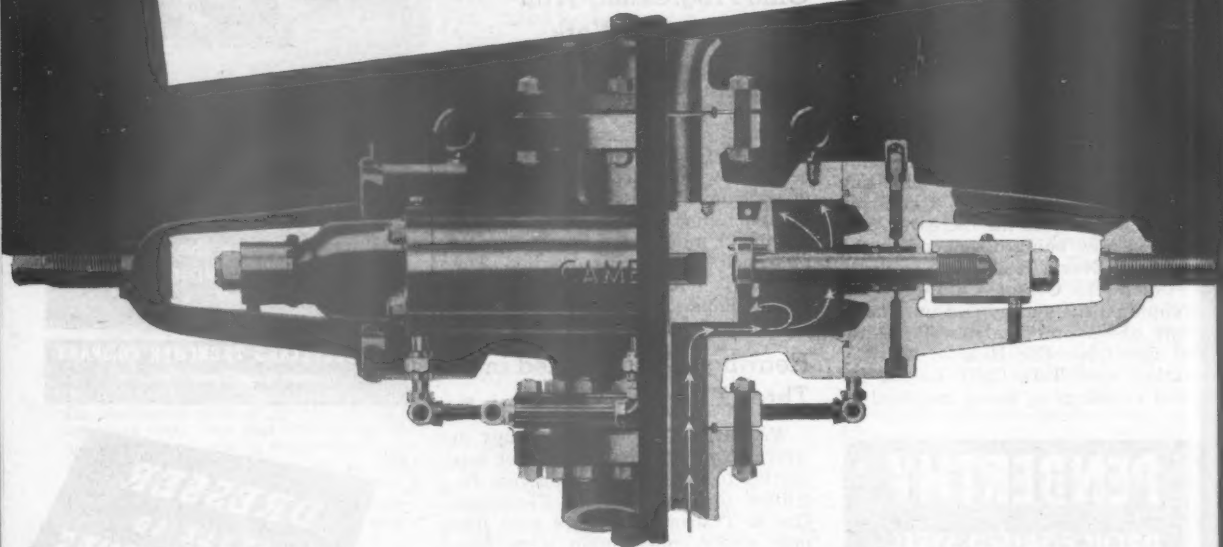

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The above illustration clearly demonstrates one of the outstanding features of the new Cameron Type "QRC" Pressure-Operated Blowout Preventer . . . the use of well pressure in closing the rams and maintaining the seal. It is this feature that accounts for the high ratio of closing pressure to well pressure, *8 to 1 as compared to 3 to 1 on earlier* models. When the rams are closed, well pressure will automatically hold them in that position until the pressure can be controlled by the drilling fluid.

The rams of the Type "QRC" Blowout Preventer can be changed with remarkable ease . . . *in only a few minutes.* The change requires only the loosening of four hammer lug nuts on each bonnet, turning a pressure control valve to "open" position and lifting straight up on the rams with a catline. These operations in reverse order complete the ram change. An experienced crew can make the change in 5 minutes, and even inexperienced crews should be able to do the job in 15 or 20 minutes.

In addition to these and other entirely new mechanical features, the Cameron Type "QRC" Pressure-Operated Blowout Preventer makes generous use of the numerous proven features of earlier Cameron models, including the famous Cameron patented self-feeding ram packing element.

Complete details will gladly be sent to interested operators on request.

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Exploration and Drilling

Week's Highlights

NEW MEXICO claims the spotlight this week, as Humble Oil & Refining Co. 1 Federal-Leonard Oil Co., SE SW 12-26-37, the extreme southeast corner of Lea County, found Ellenburger production, the first Ordovician oil for the state.

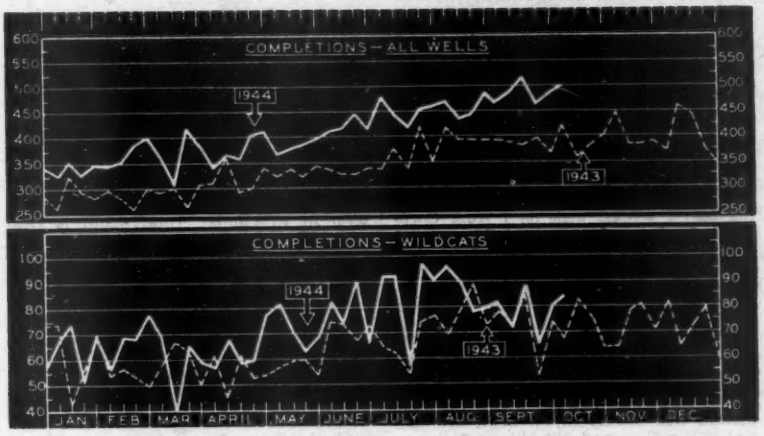
On drill-stem test at a total depth of 11,891 ft., with a 4,100-ft. water cushion, the well started flowing the water cushion after 34 minutes, in 4 more minutes was making oil and was allowed to flow oil into the pits for 1 minute before closing the testing tool. When the drill pipe was pulled, 780 ft. of free oil was recovered.

The rate of flow was estimated at 15 to 20 bbl. of oil per hour, testing about 48° gravity with an estimated 15,000,000 cu. ft. of gas daily. The flowing pressure was 3,800 lb. p.s.i., and bottom-hole pressure after 60 minutes was 5,000 p.s.i.

Top of the Ellenburger has been tentatively picked at 11,816 ft., and with a surface elevation of 3,012 ft., this puts the Ellenburger top at —8,804 ft. The well was cored in the Ellenburger to —8,879 ft., giving a total thickness drilled to date of 75 ft. The 39-minute drill-stem test was made from —8,858 to —8,879 ft., taking in 21 ft. of potential pay zone. Further drilling and coring will probably be in order before running casing to complete the well.

Looking at a map, one might wonder that there was any particular significance to this well, other than its being another Ellenburger discovery, which just happened to be across an artificial surface boundary in the form of a state line. Based on the long string of pools in the Permian, running from Pecos County, Texas, up through the Monument pool in New Mexico, this appears to be true. But despite the fact that Ellenburger production has been found in the Permian basin of West Texas in the same areas as Permian production, there is evidence that this will not always be true, and that Ellenburger oil fields will have their own geological problems and conditions, separate and distinct from Permian production.

The Humble well is lower than Ellenburger dry holes and discoveries, both to the north in New Mexico and to the south in Texas



Solid line charts current **weekly completions**

COMPLETIONS IN ALL FIELDS . . .

Week ended October 7, 1944

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.*	52	25	2	79	132,606	2,639	2,646
Ohio	4	8	9	21	62,081	760	702
Indiana	3	0	3	6	10,272	192	175
Kentucky	15	2	9	26	53,218	568	328
Illinois	23	0	19	42	112,139	1,427	1,347
Michigan	13	2	5	20	47,012	500	463
Kansas	23	2	17	42	139,925	1,388	1,273
Nebraska, Missouri, Iowa	0	0	1	1	1,525	31	37
Oklahoma	26	2	13	41	170,311	1,372	921
Texas:							
North Central	10	0	16	26	82,112	1,126	1,114
West	40	0	13	53	333,746	1,197	675
Panhandle	8	0	0	8	25,396	201	137
Eastern	3	0	1	4	33,132	244	225
Gulf Coast	14	5	8	27	176,728	956	352
Southwest	5	1	8	14	59,509	536	709
Total Texas	80	6	46	132	710,623	4,260	3,212
Louisiana:							
Northern	2	1	2	5	29,246	242	243
Southern	4	0	2	6	59,837	366	278
Total Louisiana	6	1	4	11	89,083	608	521
Arkansas	2	0	0	2	7,431	168	193
Mississippi	2	0	0	2	10,013	110	69
Southeastern States	0	0	2	2	1,671	38	†
Montana	4	2	4	10	28,054	276	172
Wyoming	3	0	1	4	18,582	132	110
Colorado-Utah	0	0	1	1	5,688	29	18
New Mexico	5	0	5	10	33,430	300	175
California	39	2	7	48	196,160	1,532	1,025
Total United States	300	52	148	500	1,829,824	16,331	13,388
Total previous week	288	56	144	488			
Total October 9, 1943	235	44	137	416			

*Does not include 46 service wells. †Included in total shown for Mississippi.

SOUTH LOUISIANA

Barnsdall Appears to Have Opened Major Oil Field

NEW ORLEANS.—Barnsdall Oil Co. et al opened what appears to be a major oil field for South Louisiana at 1 P. & M. D. Miller, in the West Tepetate area, 38-7s-3w, Jefferson Davis Parish. The well was turned into tanks, flowing estimated 28 bbl. an hour on 3/16-in. choke, tubing pressure 1,400 lb., from perforations at 8,516-28 ft. in the Ortego sand section. Gravity of the oil is 34.8°. Total depth is 10,032 ft. in shale with 7-in. casing set at 9,345 ft. This new producer is about a mile west of the recently abandoned 1 Fuselier.

Continental Oil Co. opened a field at Bayou Serpent in 30-7s-6w, the second discovery for Jefferson Davis Parish in the past 2 weeks, with its 1 King Corp. Total depth is 9,302 ft., and 7-in. casing was set at 8,170 ft. Perforated in the Ortego sand at 7,135-45 ft., the well flowed a potential of 70 bbl. of 35.7°-gravity oil in 14 hours on ⅛-in. choke, with tubing pressure 1,050 lb.

Union Sulphur Co. is still testing its 3 Gueno, deep oil discovery in the Branch area of Acadia Parish, through perforations at 11,085-90 ft. It was having trouble with chokes due to high pressure. Completion was attempted on September 29, and the well flowed 210 bbl. in 24 hours on 10/64-in. choke, gravity 45°, tubing pressure 6,300 lb., gas-oil ratio 5,900. Further tests were made and last gage showed the well flowing 260 bbl. daily on 10/64-in. choke, tubing pressure 6,400 lb., gas-oil ratio 11,000. Total depth is 11,316 ft., with 5½-in. liner set to 11,125 ft.

Phillips Petroleum Co. 1 Onez, wildcat in 16-10s-1e, is being completed at 10,020 ft. as a gas well to open new production in Acadia Parish. Perforations are at 7,738-41 ft.

Continental completed its second producer in the East Moss Lake field, Calcasieu Parish, at 2 Prairie L. & C. Co., 2-11s-9w, 2,650 ft. east of the discovery well. Total depth is 10,500 ft. with 5-in. liner on bottom. Perforated in the discovery zone, the well flowed 201 bbl. in 20 hours through 3/16-in. choke.

TEXAS GULF COAST

Moran Turns Lavaca Test Into Field Discovery

HOUSTON.—Moran Oil Co. 1 Lell, wildcat discovery in Lavaca County, flowed 66.20 bbl. daily on production test. This wildcat was drilled to 6,790 ft. by Jack W. Frazier et al, who set 5½-in. at plugged-back depth of 5,930 ft. and temporarily abandoned the test in August. Moran took over for completion.

Amerada Petroleum Corp. is still testing for final completion its 1 Daboval wildcat in Wharton County, 8 miles southwest of El Campo. Total depth is 7,430 ft., with 5-in. casing set at 7,145 ft. This well was brought in through perforations at 7,025-27 ft., flowing 47 bbl. on 6/64-in. choke, with tubing pressure of 2,100 lb.

Magnolia Petroleum Co. opened a new sand on the flank of Clay Creek field, Washington County, at 1 Lauter. The well swabbed 4 bbl. an hour of 35°-gravity oil from perforations at 6,606-11 ft. Total depth is 8,022 ft., with 7-in. casing set at 6,323 ft. Operators are rigging up pumping equipment.

Shell Oil Co., Inc. has extended Wilcox production at Livingston field, Polk County, southeast of Humble Oil & Refining Co.'s Granbury wells, at 2 R. H. Jones et al. Total depth is 7,287 ft. and top of the Wilcox was reached at 6,989 ft., with perforations at 6,989-7,012 ft. the well flowed potential of 145.8 bbl. through ⅛-in. choke.

Cities Service Oil Co. 1 Winnie Poole, offset to the Ramsey field discovery well in Colorado County, tested gas-condensate in perforations at 8,885-90 ft. with same salt water. Operators squeezed perforations and drilled out cement to 8,888 ft. The well came in through the old perforations, making gas and some salt water, and operators are now waiting on cement to set after a resqueeze job. Total depth is 9,052 ft., with 5½-in. casing on bottom.

UPPER GULF COAST WILDCAT COMPLETIONS

Galveston County: Pan American 1 University of Texas, H. B. Littlefield Sur., near Texas City, dry at 7,012 ft.

Lavaca County, Moran Oil Co. 1 Joe W. Lell et al, 4½ mi. SW of Hallettsville, in James Kerr Sur. 9, IP 66.20 bbl. through ⅛-in. choke, perf. 5,914-19 ft., gas-oil ratio 151, TP 320 lb., CP 560 lb., TD 7,690 ft., PB TD 5,930 ft. Discovery.

Liberty County: Texas 1 Geo. A. Moore et al, Malinda Whittington Sur., 2 mi. NE of Devers, dry at 6,908 ft.

Waller County: Kirby Petroleum Co. 1 G. A. Kellner, Brookshire area, Wm. Cooper Sur., dry at 3,347 ft.

PERMIAN BASIN

Three Field Openers in West Texas Probable

MIDLAND. — One new Delaware sand pool and two new lower Permian fields appear ready for the new discovery list in West Texas. In Ward County, 4 miles west of Pyote and just east of the Quito Delaware sand gas field, Lion Oil Refining Co. 1-B University, Section 43, Block 18, University Lands, logged pay in the Delaware sand at 4,970-85 ft., total depth, where it swabbed 43 bbl. of oil daily, with no water, natural, and prepared to shoot.

In Gaines County, Humble Oil & Refining Co. 1 Doss, about 10 miles southwest of Seminole, swabbed 3 bbl. of oil per hour, with some gas, after perforating at 7,030-7,233 ft., in the Fullerton pay zone.

In eastern Upton County, and off the beaten track of any well-established production trend, Humble appeared to have another discovery in its 1 Parrot et al, Section 3, ELRR Survey. On a 55-minute drill-stem test at 7,539-99 ft., in Permian lime, it showed gas in 15 minutes, estimated at 22,000 cu. ft., recovered 220 ft. of oil-cut and gas-cut mud, 500 ft. of oil and 20 ft. of muddy water. Nearest production is in the Big Lake field, about 20 miles to the southeast. The 1 Parrot has been reported checking around 140 ft. lower structurally than Plymouth Oil Co. 1 Alford, a 10,384-ft. dry hole only 3½ miles to the southeast.

The Texas Co. 1 L. Y. P. Montgomery is a new wildcat location 6 miles north of the Slaughter pool, Hockley County, in Labor 19, League 70, Val Verde C.S.L. Survey, to be drilled to 5,000 ft. A new northern Pecos County wildcat has been staked at Byrd-Frost, Inc., 1 H. Giesecke, 2 miles south of the Gulf-Wentz area, in NE NE NW Section 54, Block 11, H&GN RR Survey. B. F. Phillips, of Dallas, spotted his 1 H. K. Hinde in NW NE NW Section 27, Block 174, on the west edge of the Yates field, Pecos County. In southwestern Terry County, DeKalb Agricultural Association 1 A. B. Jenkins was staked for a 5,500-ft. wildcat in NE NE Section 29, Block DD, Gibson Survey, 6 miles southwest of Wellman.

In Lamb County, Humble 1 Jackson, closely watched wildcat in the northern portion of the basin, perforated casing at 6,645-6,705 ft. and started swabbing through tubing to test but had to pull tubing when packer failed.

WEST TEXAS WILDCAT COMPLETIONS

Andrews County: Shell 1 G. M. Cox, Sec. 5, Blk. A-31, PSL, 8 mi. NW Fullerton pool, elev. 3,430 ft., San Andres 4,350 ft., Simpson 10,270 ft., Ellen-

DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 7 crude oil	Distillate, allied products	October PAW quota all oils	Sept. 30 crude oil
Arkansas	80,600	4,500	83,000	80,700
California	886,750	51,100	937,300	882,500
Colorado	8,900	.....	8,500	8,950
Eastern	69,500	6,100	80,200	68,800
Illinois	194,800	11,500	217,100	210,300
Indiana	13,300	.....	13,500	13,600
Kansas	251,300	4,300	280,000	277,500
Kentucky	24,400	2,500	27,800	28,600
Louisiana	363,800	35,000	385,000	361,350
North Louisiana	74,050	.....	.....	73,000
South Louisiana	289,750	.....	.....	288,350
Michigan	51,900	400	50,500	49,300
Mississippi	49,250	.....	46,000	48,850
Montana	23,950	200	22,300	23,950
Nebraska	950	.....	1,000	900
New Mexico	103,900	5,500	115,500	106,250
Oklahoma	344,050	27,000	386,800	343,400
Texas	2,133,350	138,000	2,278,000	2,156,150
East Texas	371,350	.....	.....	370,900
East Central Texas	149,500	.....	.....	149,800
North Central Texas	148,800	.....	.....	147,850
Texas Panhandle	98,800	.....	.....	98,750
West Texas	492,800	.....	.....	504,200
South Central (S. A.)	19,750	.....	.....	19,300
South Texas (Laredo)	77,800	.....	.....	79,000
Lower Gulf Coast	236,850	.....	.....	243,300
Upper Gulf Coast	537,700	.....	.....	543,050
Wyoming	96,650	3,000	98,300	97,100
Total United States	4,697,350	289,100	5,010,800	4,758,200
Change from previous week	down 60,850	.....	.....	.....
Total production January 1-October 7, 1944				1,271,419,270 bbl.
Same period last year				1,128,279,150 bbl.

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Cross Sectional View shows the simple design with the float chamber welded to the tubing section of the valve. Below the float, shown in raised position, are the slotted ports for entry of fluid from the annular space; the other port leading down below the seat permits entry of fluid from the tubing. Gas will not operate the float.

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Cross Section View

Halbert Flow Valve Division

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burger 10,880 ft., grante 11,058 ft., dry, TD 11,061 ft.

Crane County: Magnolia 1 State-Flood, Sec. 20, Blk. 3, H&TC Sur., outpost to McKee pool, elev. 2,449 ft., San Andres 2,480 ft., base Permian 5,400 ft., Waddell 5,842 ft., dry, TD 6,181 ft.

Crockett County: Watchorn Oil & Gas 1 Geo. L. Thompson, Sec. 73, Blk. 1, I&GN Sur., NE Yates pool, elev. 2,165 ft., Pennsylvania 5,870 ft., Simpson 6,680 ft., Ellenburger 7,360 ft., dry, TD 7,640 ft.

Irion County: Shell 1 Tankersley Est., Sec. 12, GC&SF Sur., 11 mi. SE Mertzon, elev. 2,333 ft., Ellenburger 7,360 ft., dry, TD 8,357 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—The second important oil discovery in 2 weeks for Lea County was registered by Gulf Oil Corp. 1 Vivian-Drinkard, in NE NW of 30-22-38, which showed some gas on a drill-stem test at 6,285-6,352 ft., then on a test at 6,365-6,450 ft. flowed clean 37.5°-gravity oil at estimated rate of 25 to 35 bbl. per hour. The pay is identified as the Clear Fork section of the lower Permian and is equivalent to the main pay in the Fullerton field, 15 miles to the east in Andrews County, Texas. Operators planned to drill to about 6,500 ft. before running casing to complete. About 2 miles east of the Eunice-Penrose area, where production is obtained from upper Permian sands and lime, this new Gulf discovery is believed by geologists to be the forerunner of a major field.

The sensational discovery of the previous week, Humble Oil & Refining Co. 1 Federal-Leonard Oil Co., 22 miles south of Gulf's new producer, drilled deeper into the Ellenburger from 11,891 ft., where it flowed at the rate of 20 bbl. per hour, and on a test at 11,891-913 ft. flowed at the rate of 77 bbl. per hour, with gas-oil ratio of 1,640. Then the well was drilled to its present depth of 11,948 ft. where another test is being made.

Vickers Petroleum Co., Inc., 1 State is a new 5,000-ft. wildcat staked in the center of Lot 8, 2-16-34, 10 miles west of Lovington. A new 5,000-ft. wildcat was staked in De Baca County by Frank Griggs and John Darden at 1 State, NE NE in 11-4n-26e, receiving support from Pure Oil Co. and Atlantic Refining Co.

SOUTHEASTERN NEW MEXICO WILDCAT COMPLETIONS

DeBaca County: Griggs et al 1 Steele, 26-4n-24e, 12 mi. NW Fort Sumner, elev. 4,240 ft., dry, TD 5,550 ft.

Eddy County: Ross Luck and Cunningham 1 Cowan, 3-21s-28e, elev. 3,286 ft., dry, TD 1,340 ft.

Lea County: Devonian 1 State, 32-17s-34e, elev. 4,085 ft., top pay 4,685 ft., IP 36 bbl. dry, TD 4,729 ft.

TEXAS PANHANDLE

AMARILLO.—Phillips Petroleum Co. is starting a new Sherman County wildcat at 1 Ezra, 2,534 ft. from north and west lines of Section 198, Block 1-C, G. H. & H. Survey, to be drilled to 7,000 ft. In Deaf Smith County, Humble Oil & Refining Co. 1 Hyslop, projected 9,000-ft. test, was drilling below 2,475 ft.

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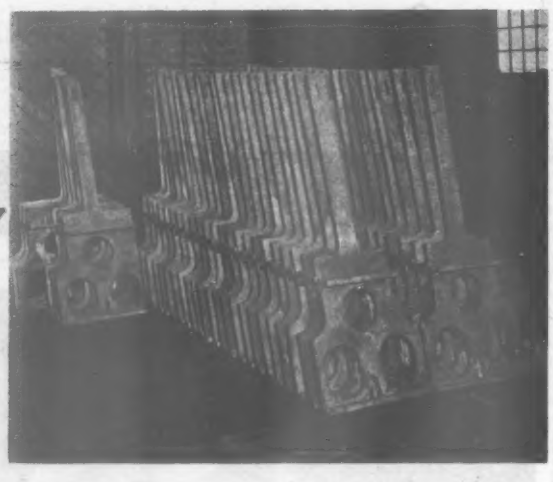

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SOUTHWEST TEXAS

Humble Finishes Producer In Atascosa County

CORPUS CHRISTI.—Humble Oil & Refining Co. 1 Coward & Lutgen et al in the Imogene field, Atascosa County, was completed for 56.07 bbl. of 36°-gravity oil daily on ¼-in. choke, with tubing pressure 150 lb., no water. Perforations are at 7,642-47 ft. Total depth is 7,654 ft., with 5½-in. casing set at 7,648 ft.

Humble's 1 A. M. Lockwood, 3,900 ft. southwest of the discovery well in the Charlotte field, Atascosa County, which has been testing in the Edwards lime discovery zone above the plugged-back depth, 6,898 ft., is reported to have recovered 70 per cent water after acidizing and is now drilling out float collar. Total depth is 6,919 ft., with 5½-in. set on bottom. Humble is moving in rig to the 4 E. J. Pruitt et ux in the same area.

Magnolia Petroleum Co. 1 W. E. Erp, wildcat 9 miles west of Pettus, Bee County, topped a sand at 6,979 ft. showing oil ran drill-stem test at 6,979-82 ft., for 45 minutes and recovered 1,530 ft. of 35.3°-gravity oil and 720 ft. of salt water. Tubing pressure was 2,825 lb., casing pressure 3,975 lb. The test is now coring ahead from 7,048 ft.

Humble 1 D. Sullivan, wildcat 8 miles southeast of Falfurrias, Brooks County, is waiting on cement to set with 13⅜-in. casing landed at 2,991 ft. Total depth is 3,000 ft.

Amerada Petroleum Corp. is still testing at the 1 Ada G. McFadden et al about 12 miles westerly from Goliad, in Goliad County. Total depth is 10,046 ft., with plugged-back total depth 8,956 ft.

H. R. Smith and W. C. McBride, Inc., 1 W. C. McCaskill, Jr., wildcat in the Porter area of Karnes County, which has been running a series of tests in the sand just below 7,400 ft., ran another drill-stem test, this time at 7,427-35 ft. It developed 82 lb. working pressure in 15 minutes, recovered 30 ft. of pipe-line oil and 450 ft. of salt water. Bottom-hole shut-in pressure was 3,250 lb. The test is coring ahead at 7,560 ft.

Phillips Petroleum Co. 1 Mrs. N. J.

Lyons (Runge), in the Runge field, Karnes County, flowed potential of 144.88 bbl. of 39.40-gravity oil daily on ¼-in. choke, gas-oil ratio 7,200, tubing pressure 1,575 lb., 1 per cent water, from perforations at 5,691-96 ft. Total depth is 7,880 ft., plugged back to 6,660 ft.

Magnolia 1 C. K. Maley, wildcat 7 miles northwest of Oakville, in Live Oak County, tried two drill-stem tests at 6,805-08 ft. On the first the choke plugged, and on the second the packer collapsed in 3 minutes. Recovery on the second test was 210 ft. of mud. The test is now coring from 6,818 ft.

Edwin Jones 4-C Ezzell, in the San Caja field, McMullen County, which is testing for water contact, is flowing under 1,620 lb. pressure on ¼-in. choke from perforations at 6,472-74 ft. No water is showing yet in the flow.

"Boedeker" is the name given by the oil-field nomenclature committee of South Texas Geological Society to the field discovered by Sun Oil Co. at 3-A Boedecker Estate, Survey 16, Brooks County.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Bastrop County: Gordon M. Griffin 1 C. Y. Powell, 3 mi. NW of Red Rock in J. C. Welchmeyer Sur., dry at 2,202 ft.

Bee County: Joe Cosner (was Burford Goodwin) 1 Isabella Linke, 4 mi. S of Beeville, in Bee County School Land Sur. 13, dry at 4,206 ft.

Duval County: Argo Oil Corp. 1 Rufino Garcia, 8 mi. NW of Falfurrias, in Copita Farm & Garden Tracts, dry at 6,700 ft.

Duval County: Argo Oil Corp. 1 Frank Vaello, Jr., 8 mi. NW of Benavides, in J. S. McCampbell Sur. 536, dry at 4,500 ft.

Jim Hogg County: Sun 5 A. C. Jones, Agua Nueva De Abajo grant, dry at 4,702 ft.

Starr County: T. E. Stephens 5 M. Hinojosa et al, Porcion III, dry at 2,140 ft.

APPALACHIAN FIELD

Crawford County Test Has Encouraging Gas Show

PITTSBURGH. — Appalachian Development Corp.'s test on the Alfa Cozad farm in Beaver Township, Crawford County, is showing 75,000 cu. ft. gas in the top of the Oriskany sand. From a surface elevation of 1,026 ft. the Onondaga was topped at 2,142 ft. Oriskany at 2,388 ft., and the gas at 2,390 ft.

In Preston County, West Virginia, the important Oriskany test of Wm. E. Snee et al on the Harry Sisler farm on the Briery anticline, Portland district, is drilling at 5,813 ft. The last 30 ft. appeared shaly and was cemented. From a surface elevation of 2,186 ft. the top of the Corniferous chert was at 5,613 ft. As the bottom of this member often shows a shale section instead of hard cherty lime, the hole is presumed to be near the Oriskany cap. The chert was lighter colored than to the north. A commercial well would open a new reserve.

In Lewis County, the deep test of Hope Natural Gas Co. is drilling in shale at 6,638 ft. The surface elevation is 1,152 ft. and the hole is nearing the Corniferous lime. This test is in the Freeman Creek district, on the J. L. Bailey farm. In Ritchie County, C. T. Smith et al completed a test on the U. S. G Ferrell land in Grant district, in the Maxton sand, good for 800,000 cu. ft. of gas at total depth of 1,508 ft.

CALIFORNIA

Standard's Deep Test Now Below Old State Record

LOS ANGELES.—Standard Oil Co. of California's deep test in the Coles Levee field of Kern County, San Joaquin Valley, has reached 15,072 ft., 67 ft. below the bottom of Continental Oil Co.'s deep well drilled several years ago in the Wasco field. Standard's well was started to determine the possibility of developing deep production at Coles Levee and at the same time to get a log of the area, as its geologic column should correspond with Elk Hills and other adjacent fields.

The formation is still a hard shale, and since this has persisted for 200 ft. it is thought a sand body will be reached soon. Unconfirmed reports indicate the well is in the Eocene, and close to the Cretaceous, which it is hoped to reach. Whether this well will reach basement remains to be seen, as the section has shown substantial thicknesses of Miocene and Eocene sediments. It is the second well in California to pass 15,000 ft. High praise is given to the equipment used and the way it has performed.

Buena Vista Hills and Elk Hills, undergoing development simultaneously, reached higher production levels and are headed for still higher. Elk Hills output has increased over 6,000 bbl. daily since aggressive work was started several weeks ago

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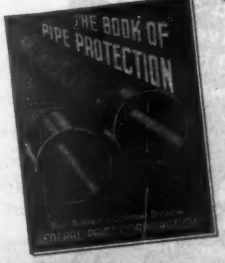

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and new wells appear to be averaging around 200 bbl. daily. The Navy last week opened up the three Stevens sand wells of Miocene age that had been shut in since completion by Standard. This will increase the output of light refinable crude oil, and by an arrangement made several months ago will enable the Navy to process the natural gas in Standard's natural-gasoline plant at Coles Levee. All work at Elk Hills is under supervision of representatives of the Navy, with Standard doing the development on a nonprofit basis. The present objective is to step up daily production at Elk Hills to 65,000 bbl.

The Texas Co., Union Oil Co. of California, Shell Oil Co., Inc., and others were successful bidders on additional oil for the remainder of the year. Standard does not want to be placed in the position of developing the field for the Navy and then taking the oil, so all but Standard's own production is going to other buyers. Union has started work on its connecting link and Texas soon will begin laying its new line to connect with the Valley Pipe Line extending over to tidewater on the coast.

A smaller number of new wells will be drilled at Buena Vista Hills than at Elk Hills, but they show a much higher initial. Production in California during October will probably be above 900,000 bbl. daily, including condensate but eliminating natural gasoline, which has been running around 45,000 bbl. per day.

Amerada Petroleum Corp., Texas and Standard are increasing production capacity in the Rio Vista gas field to meet expected increases in demand for natural gas in the San Francisco Bay region during the coming winter. Present operations are restricted to the lower zone discovered several months ago. Exploration work in the northern counties will probably slow up when roads get sloppy from the winter rains, but the need for natural gas is so acute that wildcat operations will be kept up as long as possible.

CALIFORNIA WILDCAT COMPLETIONS

Fresno County, Jacalitos outpost: Texas 11-6 Hawxhurst, 6-22s-16e, formation test, 4,776-4,857 ft., recovered mud and water, no oil or gas, base McClure 4,736 ft., top Wilshire zone 4,766 ft., base Wilshire zone 4,814 ft., bottomed in Temblor Miocene, dry at 4,857 ft.

Riverdale outpost: General Petroleum 1-32 Cryan, 32-16s-19e, Kreyenhagen 7,572 ft., Courtney sand 7,847 ft., Domengine upper Eocene 7,923 ft., Paleocene lower Eocene 7,954 ft., dry at 8,142 ft.

San Joaquin district: Superior 88-32 San Joaquin, 32-15s-17e, dry at 7,310 ft.

Solano County, Kirby Hills: Shell 1 Lambie, 25-4s-1w, abandoned at 2,617 ft. following gas blowout that wrecked hole.

Ventura County, Piru outpost: Standard 2-1 Bowman, 14-4n-18w, dry at 7,988 ft.

Orange County, Sunset Beach: Standard of California 1 Lomita Gun Club, 29-5s-11w, dry at 5,803 ft.

Kern County, Tejon outpost: Richfield 15-15 S.P., 15-11n-19w, dry at 7,309 ft.

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N. CENTRAL TEXAS

Wilbarger County Pool Is Opened by Fain-McGaha

WICHITA FALLS.—A new pool in Wilbarger County has been found by Fain-McGaha Oil Corp. 1 G. K. Martin, Section 5, Block 11, H&TCRR Survey, 3 miles west of the Fargo pool. It topped Palo Pinto lime at 4,699 ft. and drilled saturated lime at 4,765-4,803 ft. On a 30-minute drill-stem test at 4,750-76 ft., which took in only 11 ft. of the 38-ft. pay section, it showed gas in 13 minutes, recovered 150 ft. of oil and 115 ft. of oil-cut mud. With total depth of 4,841 ft., it cemented 5½-in. casing at 4,841 ft. and will perforate pipe to complete.

Cooke County.—Kadane-Griffith Oil Co. 1 Hopkins, new shallow discovery in the southwestern part of the county, was completed for initial gage of 105.72 bbl. of 39.4°-gravity oil in 3 hours through ½-in. choke, from total depth of 2,983 ft. in sandy conglomerate pay. The Texas Co. 1 Rasure, north of Sivels Bend, Red River area, kicked off and flowed oil and salt water by heads from perforations at 6,760-68 ft., then found a leaky collar at 5,626 ft. and hole has been plugged back to 5,900 ft.

In Grayson County, Pure Oil Co. 1 Quinton Little, 2 miles southwest of Gordonville, was drilling below 7,206 ft. in hard silty sand. A new wildcat location was staked by Seitz, Comegys & Seitz and Humble Oil & Refining Co. at 1 J. B. Walling, in the southwest corner of a 480-acre tract in Sarah Cross Survey A-210, 4 miles east of Tioga. Contract depth is 5,000 ft.

The Texas Co. is starting 1 Leola P. Hapgood as a 7,000-ft. wildcat 6 miles northwest of Bellevue, in Clay County, in Section 84, Marion CSL Survey A-308. In Montague County, Highland Gasoline Co. 1 Roxy Howard et al is a new 5,500-ft. wildcat 12 miles northeast of Nocona, in SW SE of Section 12, Kaufman CSL Survey. King County received a new wildcat location, Ohio Oil Co. 1 W. R. Ross, Section 24 of R. B. Masterson Survey.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: Bridwell Oil and Texas Co. 5 Oil Investment Co., Sec. 126, J. W. Harris subd. of Club ranch, 4 mi. N and 1 mi. W Archer City, elev. 971 ft., dry, TD 5,462 ft.

G. E. Kadane and Sunray Oil Co. 1 W. M. Coleman, Sec. 81, ATNCL Sur., 3 mi. W Scotland, elev. 956 ft., Caddo 5,159 ft., Ellenburger 5,700 ft., dry, TD 5,755 ft.

Clay County: W. T. Jones et al 1 R. P. Henry, Jr., and C. L. Estop (same as Sussex Oil Co. 1 Henry Estop), Blk. 62, Byers Bros. subd., 1 mi. W and 2 mi. N Petrolia, dry, TD 1,156 ft.

Cooke County: Northern Ordnance 1 W. F. Soloman, Wm. Hunt Sur., A-493, 5 mi. N and 2 mi. E Gainesville, dry, TD 4,974 ft.

Denton County: Northern Ordnance, Inc. 1 D. W. Light, C. Fliesner Sur., A-431, 5 mi. E and 1 mi. S Pilot Point, elev. 592 ft., Ellenburger 3,692 ft., dry, TD 3,828 ft.

Grayson County: Seitz, Comegys & Seitz 1 J. N. Vaughn, Jr., Sarah Shoto Sur., A-1079, 3½ mi. W and 1 mi. N Gunter, Simpson 4,423 ft., Ellenburger 4,848 ft., dry, TD 5,008 ft.

Wilbarger County: T. Leo Moore et al 1 Sam Kelly et al, Sec. 34, Blk. 13, H&TC Sur., 1 mi. W Harrold, elev. 1,203 ft., pumped 36 bbl. day, TD 3,297 ft.

Young County: Rathke Oil Co. 1 C. W. Johnson "B," H. F. Young Sur., A-1286, 1 mi. S and 1½ mi. E Graham, temp. abandoned, TD 1,938 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Brown County: D. H. Brock 2 H. L. Craven, Lot 7, Chas. Messer Sur., No. 127, 3 mi. NW Winchell, dry, TD 893 ft.

Jones County: Bell-Oils, Inc. 2 Beaty-Aiken, Sec. 44, Deaf and Dumb Asylum lands, 5 mi. S Avoca, elev. 1,617 ft., dry, TD 3,414 ft.

Lewis Oil Co. 2-B Henry Sayles, Sec. 43, Blk. 16, T&P Sur., 4 mi. N Lanius, elev. 1,622 ft., Swastika sand 2,400-05 ft., dry, TD 2,405 ft.

Shackelford County: W. S. Churchill 1 G. R. Davis, Sec. 1, Blk. 13, T&P Sur., 10 mi. W Albany, elev. 1,844 ft., Sedwick 1,106 ft., dry, TD 1,886 ft.

Taylor County: Eltex Ltd. 1 W. M. Hayes, Subd. 16, Grimes CSL, 3 mi. NE Merkel, elev. 1,848 ft., Gunsight 2,812-14 ft., dry, TD 2,910 ft.

West Central Drlg. Co. 1 Mrs. Jessie Brown et al, Sec. 34, Blk. 17, T&P Sur., 1 mi. N Tye, elev. 1,769 ft., dry, TD 2,520 ft.

CANADIAN FIELDS

New Tests Being Started In Many Alberta Areas

CHATHAM.—New tests are being started in many areas of Alberta. In the southern plains near Raymond, Imperial Oil-Raymond 1 is preparing site in LSD 7, 16-6-20w5, on untested acreage. On the Calling Valley-New Valley structure, east of North Turner Valley, Royalite-Calling Valley 1 has location in LSD 2, 22-21-3w5. Farther north and west, Wesreserve 1 has derrick up in LSD 7, 36-23-4w5. In the Brazeau-Nordegg area of the northwest foothills, Arrow Oil Co. will drill on Shunda Creek anticline, and Maynard Davies and associates are arranging for a test farther north on the Alexo reservation.

North Turner Valley.—Foothills Oil & Gas 19, LSD 10-11, 27-20-3w5, got upper zone of Madison at 6,200-6,980 ft. and lower at 7,135-7,230 ft. Entering the black lime at comparatively shallow depth, it will be deepened to test possible horizons below the Madison.

Taber.—Taber-Province 87-15A, LSD 13, 15-9-17w4, got initial production of 35 bbl. at total depth of 3,296 ft.

Vermilion.—Vermilion Consolidated 14, LSD 8, 19-50-5w4, was completed at 1,835 ft., pumping 24 bbl. Alberta Oil Producers 1, LSD 15, 20-50-5w4, finished at 1,817 ft. and is testing.

EASTERN TEXAS

Ten Locations in Area Include Two Wildcats

DALLAS.—Ten new locations were reported in East Texas last week, 8 field tests and 2 wildcats. In Wood County, Delta Drilling Co. 1 W. S. and M. Mosley was staked 1,790 ft. from the west and 2,200 ft. from the south lines of Seth W. Mitchell Survey, 7 miles northeast of Quitman. In the Campbell area of Hunt County, Hollingsworth Drilling Co. and Stanolind Oil & Gas Co. 1 C. H. Kimbell is being started as a Paluxy sand test, approximately 1,069 ft. southeast of the No. 1 well in the area.

Van Zandt County.—Northern Ordnance Co. 1 Shelton, Martin's Mill prospect, was reported planning to run casing to test the Rodessa and Pettit zones. Bottomed at 9,200 ft. in Travis Peak sand topped at 8,962 ft., the electric log showed fair to good streaks of porosity in the Rodessa zone at 8,277-8,619 ft. and poor porosity in the Pettit at 8,884-8,947 ft.

Wood County.—Sohio Petroleum Co. 1 Little Sandy, 4½ miles west of Hawkins, was abandoned at total depth 7,175 ft., with no shows in the Paluxy, topped at 7,100 ft. A workover job in the Manziel field, Bobby Manziel 1 Herman Johnston, J. Polk Survey, was cleaned out to old total depth of 8,526 ft. and 2-in. tubing

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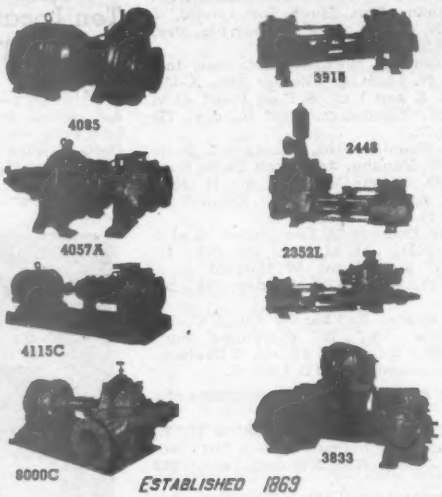

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APPROVED SAFETY ELECTRIC LANTERNS

was run to 8,435 ft. While swabbing it blew in, flowing gas, wash water and a spray of light-brown oil. When shut in, tubing pressure rose to 3,000 lb. and casing pressure to 2,700 lb. It has cemented 4½-in. pipe at 8,396 ft. to make a production test.

In Bowie County, Barnsdall and Sohio 1 Hill, west offset to their 2 Heilbron, Smackover lime discovery southwest of Texarkana, was drilling around 6,200 ft. and should reach the pay zone this week. Humble Oil & Refining Co. 1 Nichols, prospective Bacon lime discovery in southeastern Hopkins County, prepared to run casing to test, with total depth 8,567 ft. In the same area, Sun Oil Co. 1 Turner was drilling below 3,400 ft., with top of Pecan Gap chalk logged at 2,535 ft.

EAST TEXAS WILDCAT COMPLETIONS

Sabine County: Coline Oil Co. 1 Temple Lumber Co., Larkin Groce Sur., elev. 241 ft., dry, TD 9,605 ft.

ROCKY MOUNTAIN

Black-Oil Discovery Scored on Big Horn Rim

DENVER. — Another black-oil field on the western rim of the Big Horn basin of Wyoming has been proven in Husky Refining Co. 1 Krampert Unit, NE SW NW 23-51n-102w. The structure lies 8 miles west of South Oregon Basin field, from which it is separated by the Dry Creek syncline, and just east of the Half Moon fault which forms the closure on the west. The test found water in the Tensleep and Madison, but was plugged back to the Embar, and through perforations at 3,425-55 ft., produced 35 bbl. per hour after acidizing with 550 gal. The oil is heavy black crude testing 16° gravity. Top of the Embar was at 3,365 ft., and of the Tensleep at 3,550 ft.

Shawnee test high. — Dickey Oil Co. 1 Government, C NE SW 27-32n-69w, Shawnee district, Converse County, Wyoming, an important wildcat east of the Big Muddy field headed for the Leo sands, appears to be running around 1,000 ft. higher than expected. Tertiary beds are at the surface. It is drilling at 2,300 ft. in the Mowry shale and the Muddy sand now is expected at around 2,650 ft. It cut 86 ft. of Frontier sand and cores showed both oil and gas saturation, the oil being 51 gravity, but on a drill-stem test there was some water, the source of which was not apparent. The well will be drilled through the Muddy before pipe is set and a test of the Frontier sand will be made through perforations later. Showings in the Frontier were sufficient to encourage a belief in it making a well in that horizon.

Elk Basin.—Stanolind Oil & Gas Co. 1 Tp. U.S.A. Tract 5-B, NE SE SE 25-58n-100w, completed for 36 bbl. an hour, combined flow, through a 3/10-in. bean, is on a government tract purchased last fall at auction for a bonus of $448,000.

Northeastern Wyoming wildcat. — Williams Brothers are moving in for a test on the Hulett structure, northwest corner of Creek County, Wyoming, on eastern rim of the Powder River basin in 1 Government, NW NW SW 15-55n-67w, on a farmout from the Continental Oil Co. Williams Brothers Corp. and Victaulic Co. of America acquired an undivided half interest in four blocks in that area comprising 15,000 acres on the Hulett, Poison Creek, Elkhorn and Tie Creek structures. Agreement provides for two tests to the Pennsylvanian at 2,500 ft., and two to the Madison at 3,500 ft., one on each block.

Dakota test at Boone. — Stanolind is starting a test in 1 Unit, NW SE SW 10-35n-85w, Boone dome, Natrona County, Wyoming, to go to the Dakota series. This field had a gas discovery in the Shannon at 1,600 ft. in 1923 and for a number of years produced gas from that horizon. The deepest test went to 5,192 ft. and stopped in the Mowry shale. Stanolind well is ¼ mile north fo the Shannon sand discovery.

WYOMING WILDCAT COMPLETIONS

Natrona County, Iron Creek: Texas 1-A Johnson, SE SW NW 11-32n-82w, TD 3,437 ft., dry in Embar and Tensleep.

Park County, Half Moon: Husky Refining 1 Krampert Unit, NE SW NW 23-51n-102w, TD 4,285 ft., water in Tensleep and Madison, plugged back to 3,512 ft. and completed in Embar through 72 perf. at 3,425-55 ft., swabbed 4 bbl. per hour 16° gravity black oil, acidized, 550 gal., swabbed 35 bbl. per hour, top of Embar 3,365 ft., top of Tensleep 3,550 ft.

MONTANA WILDCAT COMPLETIONS

Liberty County, East Utopia: Texas 1 Nick Laas, NW SW SW 14-33n-4e, TD 2,610 ft., 5½-in. 2,604 ft., top Madison 2,347 ft., perf. 2,346½-2,349 ft., 3,000,000 cu. ft. gas, 1,025 lb. pressure shut in, gaged 25,000,000 cu. ft. from all sands before casing off.

Pondera County, Collins area: Union Oil of California 1 England, NW SW SE 11-25n-2w, TD 1,644 ft., top of Madison 1,632 ft., dry.

Hagen: Hagen Structure Oil 1 Anderson, NE SE NE 9-31n-7w, TD 2,180 ft., dry, top Colorado 1,375 ft.

Yellowstone County, Crooked Creek: Carter 1 Northern Pacific Railroad-15, SW SE 15-4n-26e, TD 6,390 ft., dry, Eagle sand 2,220, Morrison 4,490, Amsden 5,653, Madison 6,390 ft.

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ILLINOIS

Schnell Pool Promised North Extension in McClosky Lime

CENTRALIA, Ill.—The Schnell pool in Richland County was promised a north extension by Perry Fulk and Cecil Craven's 1 Martin heirs, SE NE NE 24-3n-8e, which has McClosky lime at 2,981-90 ft. In a drill-stem test the well flowed clean oil in 22 minutes. Also in Richland County Phillips Petroleum Co. 1 Richland in 6-2n-10e, was reported flowing 70 bbl. an hour after a 5,000-gal. acid treatment of McClosky lime at 3,150-59 ft. Later it was reported swabbing 35 bbl. per hour.

Twenty-three oil wells and 19 dry holes were reported completed in Illinois during the week. Fifty-two new operations were started including 16 wildcats as follows: Central Pipe Line Co. 1 Rose, SE NE SE 4-5s-3e; Deep Rock Oil Co. 1 J. M. Kirk, NE SE SE 15-7s-4e, and E. S. Adkins 1 Peabody, NE NE SW 14-7s-3e, all in Franklin County; James N. Harsh 1 H. George, NW NW SE 23-4s-1w, Perry County; L. D. King 4 C. Blakeman, SE SW SW 7-9n-14w, Clark County; Frank Mitchell, SE SE SW 36-9n-6e, Effingham County; C. E. Brehn 1 Oldham, NE NE NW 24-9s-9e, Gallatin County; Deep Rock Oil Co. 1 B. Albert, SE SE NW 33-5n-1e, Fayette County; Clark Nye 1 W. E. Tracy, NW NW NE 4-3n-12w, Lawrence County; Northern Ordnance 1 Payne, SE SE NE 3-2n-2w, of 4th p. m., Schuyler County; Bruce Martin 1 Bradshaw, SE SE SW 3-1n-14w, old dry hole at 3,125 ft., to be deepened, Edwards County; Kingwood Oil 1 Iles, NW NW SE 4-2s-14w, Wabash County; Shulman Bros. 1 Loveless, NW NE SW 20-8n-4e, Effingham County; Northern Ordnance 1 Schenck, SW SW SE 15-8n-4w of 4th p.m., Henderson County; same company 1 Deems, SW SW NW 2-7n-4w, of 4th p.m., Harry Sherman 1 Jefferson O. & G., SE SW NE 30-3s-2e, Jefferson County.

ILLINOIS WILDCAT COMPLETIONS

Clark County: Texas 1 Coldren, SW SE NE 4-11n-11w, dry at 2,406 ft., Ste. Genevieve 1,049 ft., Rosiclaire 1,035 ft., Fredonia 1,084 ft., Louisiana 2,127 ft., Chattanooga 2,146 ft., Devonian 2,236 ft.

Clay County: Amsco 1 McAllister, SE SW NW 3-2n-7e, TD 3,150 ft., PB to 2,710 ft., with Cypress sand at 2,710-24 ft., pumped 29 bbl. in 24 hours.

Cumberland County: Fogle et al 1 Young, NE SE SE 1-9n-10e, dry at 648 ft., Casey sand 591-612 ft.

Hamilton County: Phillips Petroleum 1 B. K. Leath, SE SE NE 12-4s-6e, McClosky lime 3,426-33 ft., TD 3,440 ft., acidized, pumped 85 bbl. oil and 85 bbl. water.

Magnolia 1 Kaufman-A, SE SE NW 7-4s-6e, dry at 3,453 ft., Menard 2,470 ft., Cypress 2,963 ft., Aux Vases 3,228 ft., Ste. Genevieve 3,250 ft., Fredonia 3,350 ft.

Jasper, County: Amsco 1 Walters et al, SW NE SW 29-6n-10e, dry at 2,900 ft., Barlow 2,428 ft., Cypress 2,524 ft., Ste. Genevieve 2,775 ft., McClosky 2,821-64 ft. at intervals.

Lawrence County: Olds Oil 1 J. L. Smith, NE SE NE 17-2n-12w, dry at 2,381 ft., Glen Dean 1,756 ft., Benoist 2,061 ft., Ste. Genevieve 2,240 ft., McClosky 2,315 ft.

Perry County: Texas 1 M. Monti, SW SW SW 24-4s-4w, dry at 2,868 ft., upper Glen Dean 958 ft., Cypress 1,176 ft., no Benoist, Aux Vases 1,394 ft., Ste. Genevieve 1,502 ft., Salem 1,800 ft., Osage 2,240 ft., no Louisiana, Chattanooga 2,742 ft., Devonian 2,750 ft.

KANSAS

Arbuckle Missing in Offset To Reagan Sand Discovery

SUNRAY OIL CO. 2 Orth, NE NW SW 2-14-20w, Ellis County, 1,320 ft. west of 1 Orth, which was recently completed as a 500-bbl. pumper discovery in the Reagan sand, found the Arbuckle completely missing, after checking 5 ft. low with the discovery well on the way down. The discovery well reported 13 ft. of Arbuckle. The 2 Orth found sufficient saturation in the Reagan, topped at 3,877 ft. to justify setting pipe and will test.

Also in Ellis County, Sunray 1 Younger, NE SE NE 6-14-17w, 3 miles west of the Toulon pool, appears to be good for at least 50 bbl. from Arbuckle, topped at 3,523 ft., drilled to total depth of 3,583 ft. and acidized.

Operations continue at a high level and first reports this week indicate no immediate future slackening, there being 44 new operations reported, of which 14 were new wildcat starts. This compares to 42 completions, of which 11 were wildcats. New wildcat starts reported were Barton County 1, Gove 2, McPherson 1, Ness 1, Pawnee 1, Phillips 1, Reno 2, Rice 1, Rooks 1, Stafford 2 and Trego County 1.

KANSAS WILDCAT COMPLETIONS

Butler County: Adair & Morton 1 Bennett, SE NE SE 15-29s-7e, dry, TD 3,205 ft., Mississippi lime 2,779 ft., Arbuckle 3,195 ft.

Cowley County: Texas 1 Graham, NE SE SE 7-32s-4e, dry, TD 3,460 ft., Mississippi lime 3,332 ft., Arbuckle 3,340 ft.

Marion County: Westgate Greenland 1

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Brown, NE NE SW 7-17s-3e, dry, TD 3,268 ft., Simpson 3,176 ft., Arbuckle 3,231 ft.

Graham County: Phillips 1 Chas, SW SW NW 2-9s-22w, dry, TD 3,810 ft.

Norton County: Allen & Aylward 1 Federal Land Bank, NE NE SW 33-3s-22w, dry, Arbuckle 3,763 ft., granite wash 3,815 ft., granite 3,859 ft., TD 3,870 ft.

Ottawa County: Phillips 1 Chartier, NE SE NW 28-9s-1w, dry, TD 3,596 ft., Simpson 3,448 ft., Arbuckle 3,566 ft.

Reno County: Ohio 1 Collingsworth, SW SW NW 5-26s-6w, dry, TD 4,202 ft., Simpson 4,053 ft., Arbuckle 4,146 ft.

Rooks County: Sinclair Prairie 1 Hull, NW NW SE 26-7s-18w, dry, TD 3,490 ft., conglomerate 3,400 ft., Arbuckle 3,455 ft.

Sedgwick County: Branine & Holl 1 Sautter, SE SE NE 22-29s-2w, discovery, completed for a physical potential of 205 bbl. per day from pay zone 3,025-3,036 ft., TD 3,036 ft., Kansas City 2,912 ft., Lansing 3,025 ft.

Sumner County: Southland Royalty et al 1 Duck, NE NW NW 28-34s-1e, dry, TD 3,764 ft., Mississippi lime 3,717 ft., Cherokee 3,555 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo.—Cities Service Oil Co. now has 10 oil wells, mostly of the 40 to 50-bbl.-a-day class, in the Tarkio oil pool of Atchison County, Missouri. The latest is 6 Watkins in C SW NE NW 32-65n-39w, 1,387½ ft. This well probably will be about the same size as the others. The southernmost well in the pool, 1 Craigmile, C NE NW SW 32-65n-39w, filled 680 ft. with oil following a shot at 1,391½-95½ ft. Eight quarts of nitroglycerin was used.

In Northeast Kansas, Magnolia Petroleum Co. has started drilling some 5 miles southwest of the McLouth pool at 1 C. S. Imus in SE NE SW 15-10s-19e, Jefferson County. Dan McLaughlin has started 1 Bank of McLouth in NE SE NE 17-10s-20e, south of the McLouth pool, in Jefferson County.

MISSOURI WILDCAT COMPLETIONS

Vernon County: A. W. Waymire et al 1 Stubblefield, NW SE SW 21-37n-32w, dry, TD 1,525 ft., Lamotte 1,380 ft., Paint Creek 1,405 ft.

LA.-ARK.

Antitanks Guns Used on Burning Gas Well

SHREVEPORT.—Army units from Camp Polk used antitank guns to shoot the christmas tree off of the casing at Phillips & Schoonmaker's 1 Anthony, SE NE 9-11n-14w, estimated 125,000,000 cu. ft. gas discovery in De Soto Parish, which has been burning out of control and threatening to crater. The first attempt, using only practice shells, failed because of lack of sufficient explosive power, but a second attempt using battle ammunition, succeeded after several hours of firing. With the removal of the christmas tree, it is anticipated that the well will soon be brought under control.

In Caldwell Parish, Louisiana Central Lumber Co. 1, SW NW 13-15n-3e, a wildcat, blew out while fishing and is flowing an estimated 100,000,000 cu. ft. of gas from an unknown horizon. Bottom of hole is at 10,140 ft., and casing was set at 6,500 ft.

NORTH LOUISIANA WILDCAT COMPLETIONS

De Soto Parish: G. C. Schoonmaker 1 Sample, 990 ft. south and 1,650 ft. east of NW 12-13n-14w, dry, TD 3,248 ft.

ALABAMA WILDCAT COMPLETIONS

Lauderdale County: J. L. Jaynes 1 Simpson, NE SE NW 33-1s-10w, dry, TD 500 ft.

MICHIGAN

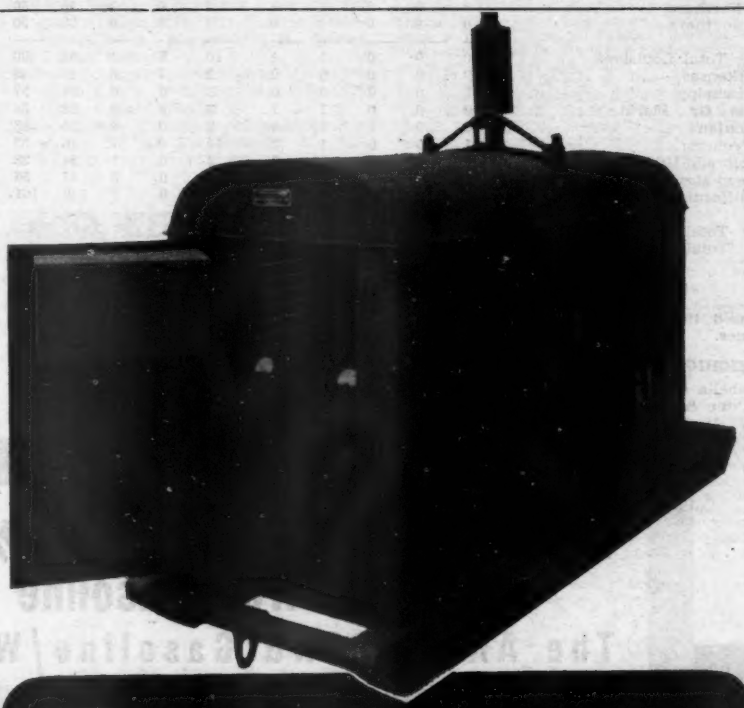
Traverse Producer Leads To Plans for More Tests

SAGINAW.—Traverse formation oil-production prospects in Michigan's leading Reed City field are highly satisfactory, a Pure Oil Co. completion has revealed, leading to plans for other wells. Pure reported initial production of 110 bbl. an hour from A-2 Richards in Section 20, Lincoln Township. The well was drilled under revised federal spacing regulations. Production in the Reed City field has been principally from the Monroe formation.

The past week yielded 10 oil producers, 2 gas wells and 6 dry holes in Michigan. Crude potential was better than 5,000 bbl. a day, with a Deep River-Arenac producer rated at 1,560 bbl. and 4 others ranging from 116 to 337. One of the producers was a 24-bbl. wildcat in Sherman Township, Isabella County. Four of the 6 dry holes were wildcats.

Extensive new drilling got under way with the state conservation department granting 25 more permits. Three of four for Isabella County are for the new Coldwater Township development. Four others are for Arenac County, three for Bay, three for Moncalm, two each for Allegan, Ottawa and Roscommon. The others for Calhoun, Clare, Ogemaw, St. Clair and Tuscola. Permits for the year now total 540.

The department announced its intension to offer 20,000 acres of state-owned lands for oil and lease rights at auction November 3. So far this year the state has



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WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended October 7, 1944					Cumulative total, 1944				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	5	0	1	2	3	2	0	16	56	74
Indiana	0	0	0	0	0	4	0	0	19	23
Illinois	2	0	0	6	8	27	0	0	240	267
Kentucky	0	0	0	5	5	13	0	0	70	83
Michigan	1	0	0	3	4	12	0	2	188	202
Kansas	1	0	0	9	10	41	0	9	330	380
Neb., Mo., Iowa	0	0	0	1	1	1	0	0	13	14
Oklahoma	2	0	0	5	7	55	0	20	212	287
Texas:										
North Central	1	0	0	7	8	50	0	1	243	294
West	0	0	0	10	10	34	0	3	135	172
Panhandle	0	0	0	0	0	0	0	2	8	10
Eastern	0	0	0	1	1	5	0	1	97	103
Gulf Coast	1	0	0	3	4	29	12	13	186	240
Southwest	0	0	0	6	6	19	4	14	187	224
Total Texas	2	0	0	27	29	137	16	34	856	1,043
Louisiana:										
Northern	0	0	0	1	1	4	0	1	45	50
Southern	0	0	0	0	0	6	6	0	38	50
Total Louisiana	0	0	0	1	1	10	6	1	83	100
Arkansas	0	0	0	0	0	2	1	0	45	48
Mississippi	0	0	0	0	0	3	0	0	54	57
Ala., Ga., Florida	0	0	0	1	1	2	0	0	22	24
Montana	0	0	1	3	4	3	0	4	36	43
Wyoming	1	0	0	1	2	14	0	1	18	33
Colorado-Utah	0	0	0	0	0	3	0	1	24	28
New Mexico	1	0	0	2	3	6	0	3	47	56
California	0	0	0	6	6	6	0	7	148	161
Total United States	10	0	2	72	84	341	23	98	2,461	2,923
Total previous week	11	3	2	65	81					

leased 195,112 acres for exploration purposes.

MICHIGAN WILDCAT COMPLETIONS

Isabella County, Sherman Township: Jetter & DeKraft 1 William Walch, SW SW NW 18-15n-6w, pumped 24 bbl. and salt water, acidized, TD 3,303 ft.

Allegan County, Fillmore Township: J. W. Lang Co. 1 George Bussies, NE SW NW 25-4n-15w, dry at 1,641 ft.

Ottawa County, Olive Township: Clifford A. Perry 1 Henry Wesseldyk, NE NE NE 24-6n-15w dry at 1,643 ft.

Zeeland Township: Voorhees Drilling Co. 1 Gerrit Nagelkirk, NE SE SW 20-5n-14w, dry at 1,659 ft.

Roscommon County, Lyon Township: Sun A-1 State-Lyon, C S½ NW SE 6-24n-4w, dry at 4,552 ft.

MISSISSIPPI

Humble Abandons Florida Test After Losing Hole

JACKSON.—Humble Oil & Refining Co. 2 Gulf Coast Realty Co., in 30-48s-30e, Collier County, Florida, has been junked and abandoned. After drilling to a total depth of 13,512 ft., circulation was lost and the pipe stuck. The crew backed off at 13,436 ft., electric log was run to the top of the fish and decision was made to junk and abandon.

Gulf Refining Co. 1 Cooper, NW NW 7-1n-16w, Lamar County, Mississippi, which had good shows on two drill-stem tests in the upper Tuscaloosa between 7,736-7,816 ft., is continuing to drill ahead to test the Massive sand in the basal Tuscaloosa. Latest drill-stem test indicates salt water at about 8,000 ft., still above the Marine Tuscaloosa.

Shell Oil Co. 1 Hibernia Bank, 330 ft. south and 880 ft. east of NW cor. 14-2n-16w, Lamar County, Mississippi, flank test on the Tatum salt dome, had the top of the chalk at 5,745 ft., and is still in chalk at 6,115 ft.

The Pure Oil Co. 2 McDowell, NE SW 12-6n-3w, Adams County, second attempt

for *Clean Cut Separation* of water from gasoline

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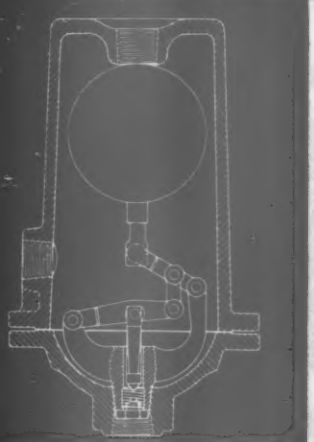

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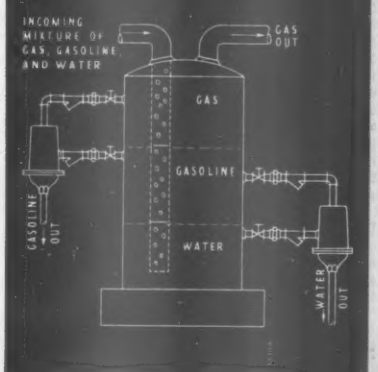


Armstrong Gasoline/Water Traps on Accumulator.

to open the Natchez pool, after showing for a condensate producer from the Massive sand, is having difficulties in squeezing off water. Preparations are being made to run a drill-stem test from perforations at 10,312-16 ft. after the latest squeeze job.

OKLAHOMA

W. Edmond May Cover Area Totaling 35,700 Acres

AS pipe-line runs from West Edmond averaged an even 30,000 bbl. from 166 connected wells last week, the field overshadowed everything else in the state. In the most comprehensive report to date on the field, Dean McGee, executive vice president of Kerlyn Oil Co., in a paper presented before the Interstate Oil Compact Commission, estimated the presently proven acreage at 20,700; the probably productive acreage at 6,700 and the possibly productive acreage at 6,700, making a grand total of 35,700 acres that may produce. He estimated 608 undrilled locations in addition to the 120 now drilling or preparing to drill; with an ultimate of 892 producing wells on 40-acre spacing if the area is completely developed. His data indicate an active, large-scale drilling campaign continuing throughout 1945.

Washita County.—The California Co. 1 Reeder, NW NW 1-8n-17w, southeast of Cordell, and the company's first Oklahoma try, is getting sand streaks showing stains and odor below 8,000 ft. This test on the south rim of the Anadarko basin is being watched closely by geologists, as it entered Granite wash at about 3,240 ft., and is now drilling close to 8,400 ft., with the section still considered Granite wash, the arkosic sand streaks being generally classed as reworked wash.

Gulf Oil Co. 1 Shields, SE NW SE 11-8n-20w, perforated with 234 shots at 6,530-70 ft., and swabbed 65 bbl. of oil and 5 bbl. of water in 4 hours, is now attempting to squeeze off water.

OKLAHOMA WILDCAT COMPLETIONS

Carter County: Sun 1 Yell, NW NW NW 8-5s-1w, discovery, flowed 120 bbl. of 37.6° gravity oil from sand at 4,040-62 ft., TD 4,276 ft.

Garvin County: Frank Buttram 1 Cloud, SE SE SW 10-4n-1w, dry, TD 4,804 ft. in Pennsylvanian.

Helmerick & Payne 1 Freeman "A," NW NW NW 24-1n-1w, dry, TD 1,400 ft.

Sinclair Prairie 1 Allred, NE NW SE 20-3n-3e, discovery, pumped 105 bbl. of 26.2° gravity oil from sand at 1,898-1,919 ft., 2 per cent water, TD 1,919 ft.

Lincoln County: Stanolind 1 Ross, SW SE SE 27-13n-3e, dry, TD 5,506 ft., dolomite 5,406 ft., Wilcox 5,415 ft., second Wilcox 5,480 ft.

Pawnee County: Continental 1 Meyerdick, SW NE NW 10-22n-5e, dry, TD 3,738 ft., Arbuckle 3,710 ft.

Pottowatomie County: Ashland 1 Stephens, NE NE SW 31-6n-5e, dry, TD 3,592 ft., Sylvan 3,585 ft.

OHIO, KENTUCKY

New Clinton Gas Pool Discovered in Lorain

COLUMBUS.—Hanley and Bird opened a new gas pool last week in the north central part of Wellington Township, Lorain County. The discovery, 1 L. W. McConnell, Lot 19, had Clinton at 2,269-78 ft., and gaged 902,000 cu. ft. daily. A location to the north will be drilled for a further test.

Two producers were completed along the west edge of the Clayton pool in Section 12, Reading Township, Perry County. Pure Oil Co. 4 Albert Wilson made 133 bbl. and Industrial Gas Co. 7 Albert Wilson 70 bbl.

The Wheeling pool was extended ½ mile south by Ohio Fuel Gas Co. 1 Vollman-Kennedy, Section 6, Liberty Township, Guernsey County. Oriskany sand at 3,326-33 ft. gaged 464,000 cu. ft.

OHIO WILDCAT COMPLETIONS

Lorain County, Wellington Township: Hanley and Bird 1 L. W. McConnell, Lot 19, Clinton 2,269-78 ft., 902,000 cu. ft. gas, TD 2,304 ft.

Medina County, Sharon Township: Wiser Oil 1 S. Himmelright, Lot 12, Clinton 3,605-40 ft., dry, 3,656-74 ft., dry, TD 3,704 ft.

Summit County, Richfield Township: H. C. Bishop 1 Dorothy Dick, Lot 7, Clinton 3,615-93 ft., dry, TD 3,773 ft.

EASTERN KENTUCKY OPERATIONS

ASHLAND.—A number of small oil-well completions in Elliott County, with three dry holes and an oil well in Powell County were featured in the report of the week's eastern Kentucky drilling operations. Two gas wells were completed.

WESTERN KENTUCKY

OWENSBORO, Ky.—Seventeen wells, 11 of which were oil producers with a total initial production of 4,969 bbl. were reported completed in Western Kentucky during the past week. The Carter Oil Co. completed three wells on the Watt Clements farm in 21-P-19, in the Uniontown field in Union County No. 9 swabbed 1,100 bbl.. No. 10 swabbed 820 bbl., and No. 11 swabbed 2,600 bbl. the first 24 hours, all producing from Cypress sand

(Continued on page 150)

PENBERTHY
QUALITY
PRODUCTS

Penberthy liquid level gages of various types—injectors—ejectors—lubricating devices all so widely used throughout the oil industry because they have always been dependable under the most severe service conditions.

All are of rugged construction and made by an organization with 57 years experience in the manufacture of quality products.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

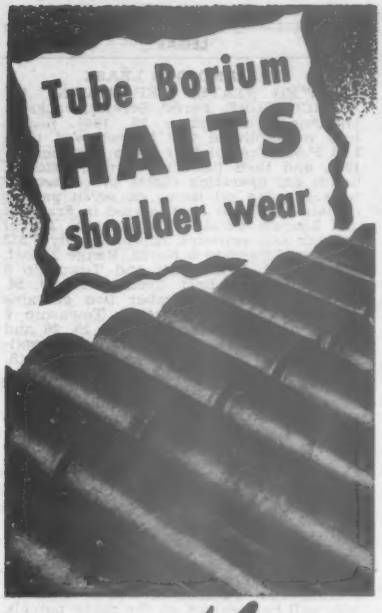
LEGAL

OIL AND GAS LEASE

UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Jackson, Mississippi, September 28, 1944. Sealed bids in duplicate will be received until 2:00 P.M., Central War Time, October 30, 1944, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on seven parcels of national forest land located in Franklin and Lincoln Counties, Mississippi. Parcel number one contains approximately 1,513 acres in Township 5 North, Range 2 East, Sections 12, 13 and 24; and Township 5 North, Range 3 East, Sections 10, 25, 26, 30 and 37. Parcel number two contains approximately 608 acres in Township 6 North, Range 2 East, Sections 25, 26 and 29. Parcel number three contains approximately 1,459 acres in Township 6 North, Range 2 East, Sections 13, 25, 26, 29, 37 and 38. Parcel number four contains approximately 1,339 acres in Township 6 North, Range 4 East, Sections 24 and 25; Township 5 North, Range 4 East, Section 1; Township 6 North, Range 5 East, Sections 30 and 31; and Township 5 North, Range 5 East, Sections 5 and 6. Parcel number five contains approximately 1,314 acres in Township 8 North, Range 5 East, Sections 14, 15, 22, 23, 26, 27, 34 and 35. Parcel number six contains approximately 272 acres in Township 6 North, Range 1 East, Sections 23 and 28. Parcel number seven contains approximately 117 acres in Township 6 North, Range 2 East, Section 37. Separate bids will be received on the seven parcels. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Masonic Building, U. S. Forest Service, Jackson 114, Mississippi.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, D. C. Notice is hereby given that the lands herein described within the Fulcher Basin gas field, N.M.P.M., New Mexico, are offered to the responsible qualified bidders of the highest cash amounts offered per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the act of August 21, 1935 (49 Stat. 674, 30 U. S. C. sec. 226) in the following parcels: T. 29 N., R. 12 W., Parcel No. 1, sec. 10, SE¼SW¼, 40 acres; Parcel No. 2, sec. 14, S½NE¼, S½, 400 acres; Parcel No. 3, sec. 15, SE¼NE¼, SE¼, 200 acres; Parcel No. 4, sec. 15, SW¼NW¼, W½SW¼, 120 acres; Parcel No. 5, sec. 22, N½, N½S½, 480 acres. Sealed bids will be received in the office of the Commissioner of the General Land Office, Interior Department Building, Washington 25, D. C., up to 12 noon October 26, 1944. Bids must be submitted on each parcel separately but if two or more parcels are awarded to the same bidder they may be included in a single lease provided the aggregate acreage does not exceed 640 acres. Each bidder must submit a certified check or cash for one-fifth of the amount bid, payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required by section 7 of Circular 1386. The remainder of the bonus bid and the first year's rental at the rate of $1.00 per acre must be paid and a $5,000 corporate surety bond must be filed by the successful bidder prior to the issuance of the lease. The deposits of the other bidders will be returned. The envelopes should be plainly marked "Bid for Parcel No. , Fulcher Basin gas field, New Mexico. Not to be opened before noon October 26, 1944." No bids received after the hour and date fixed herein for submitting bids will be considered. The successful bidders will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

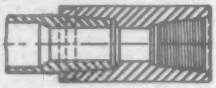


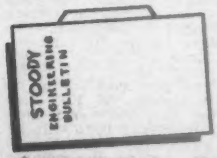
Doubles tool joint life

For fifteen years Tube Borium has been used on drilling bits to increase cutting speeds and drill more out-to-gauge hole. Now you can use this same alloy to greatly prolong the life of your tool joints!

An exceedingly small quantity of Tube Borium welded in a ring around the shoulder not only doubles tool joint life—even under the toughest operating conditions—but maintains over all joint strength and correct elevator contour. Applications are economically made on both new and resleeved joints.

APPLICATION: Accepted method of application is to under-cut new or resleeved joints at the shoulder to form a recess 1/8" deep by 1 1/2" wide. The recess is then filled by welding in with 3/16" Electric Tube Borium to form the wear resistant inlay.





Write for this special Stoody engineering bulletin describing in detail hard-facing procedures on tool joints—no obligation.

STOODY COMPANY
1138 WEST SLAUSON, WHITTIER, CALIF.

STOODY HARD-FACING ALLOYS
Retard wear... Save Repair

Among the Drilling Contractors

Drilling & Exploration Co. has spudded a second well which it is drilling under contract for Western Gulf Oil Co. in the Oak Canyon district, Los Angeles County, California, and is making preparations to complete 1-A for the same company on the Wickham property.

Fowler Drilling Co., Los Angeles, has been awarded contract to redrill 6 Kettler in the Torrance field, Los Angeles Basin, California, for F. C. Kelley and the crew will go back into the hole within the next day or two.

McCarthy & O'Brien, California drilling contractors with offices in Los Angeles, recently received an extension of drilling contracts that will keep all equipment busy for some time to come. Standard and portable equipment are operated by the firm.

Alberta Drilling & Development Co. of Calgary is drilling below 3,140 ft. on Trans-Alberta 1 test, LSD 8, 21-1-20w4, in the Twin River area of southern Alberta, and below 665 ft. on Alliance 1, LSD 15, 19-20-1w4, in the Antelope Hills area of eastern Alberta.

General Petroleums of Calgary has completed Great Bend Oils 1, LSD 4, 28-52-3w5, in the Marwayne area north of Vermilion and is preparing to test at 1,924 ft. Rig is being moved for Great Bend 2 in the Vermilion field.

William de Koch of **K. & K. Drilling Co.** of Vermilion, Alta., is visiting Los Angeles to arrange for additional equipment to handle the drilling of new wells in the plains areas of Alberta.

C. E. Mills, Lloydminster, Alta., recently finished drilling Silverdale 1, LSD 10, 12-49-1w4, in the Alberta end of the Lloydminster field. Results indicate the oil area may extend into Saskatchewan.

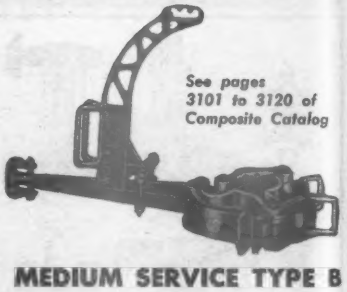
E. E. "Wimpy" Moore, former engineer and superintendent for Arrow Drilling Co., and recently in charge of tools for Jordan Petroleum Co., former E. E. Moore Drilling Co., has acquired a string of 5,000-ft. tools and is drilling his first well for Skelly Oil Co. at Konawa, Okla. He has on order a heavy-duty rig.

Camay Drilling Co., California drilling-contracting firm, announces the appointment of Tom Bannon as assistant general manager. Bannon was for a number of years associated with Lane-Wells Co.

L. B. Jackson is the drilling contractor on the R. L. Kemp 1 Long, in C SE NW 15-16n-5e, near Avery in Lincoln County, Oklahoma. Contractor was moving in tools to start operations.

Nelson Drilling Co. has announced a new wildcat location in eastern Rice County, Kansas. The 1 Allison has been staked in NE NE NE 23-

WEB WILSON
Rotary Tongs



See pages 3101 to 3120 of Composite Catalog

MEDIUM SERVICE TYPE B
Meets the need for a lighter, shorter Tong for regular rigs and the heavy, portable or Blitz rigs. Strong, fast, easily operated and safe for the worker.
Put this WEB WILSON Tong on your rigs and be convinced.

WEB WILSON
Oil Tools
W. W. WILSON BUILDING
HUNTINGTON PARK CALIF.

PREVENT LEAKS--
. . . and you won't have to stop them

Plugging up leaks after they start is somewhat like closing the gate after the horse is gone. RECTORSEAL, applied to connections . . . threaded, coupled, or gasket . . . when they are made up, stops leaks by preventing them. It forms a permanent leak-proof seal, impervious to oils, fumes, salt water and dilute acids. It retains its plastic, elastic consistency for the life of the connection, and permits easy breakout of joints.

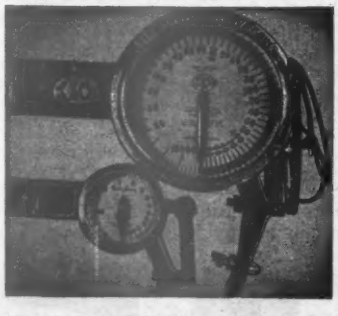
RECTORSEAL is a definite money-saver. Begin using it now on all connections. Your supply store has RECTORSEAL in convenient sizes to fit your needs.

RECTOR WELL EQUIPMENT COMPANY, INC.
Fort Worth National Bank Bldg.,
Fort Worth, Texas
Export: Lucey Export Corp., Woolworth Bldg., N.Y.C.

RECTORSEAL
the positive
LEAK PREVENTER
RECTOR

RECTORSEAL
THE POSITIVE LEAK PREVENTER

20 LINE SCALES to choose from



(Above) Super 500,000# capacity, 14" dial. (Below) Packer Special, Capacity 40,000#, 6" dial. 18 other models for every drilling, well servicing, or work-over need.

With a Line Scale you know the pull on the line, and the weight on the bit in pounds. Accurate, sensitive, rugged, durable and economical.

Although we are working at top capacity to supply ship yards and the U. S. Navy—we are still able to furnish Line Scales to the oil industry. Write for folder and prices.

LINE SCALE CO., Inc.
Phone 2-1765, 907-11 SE 29th St., Box 4245
Oklahoma City, Oklahoma

19-6w, 4 miles east of the town of Little River and 1 mile northwest of the Smyres pool.

Herndon Drilling Co. has been awarded the contract on the Texas Co. 1 Weatherbee, in SW SW SW 17-29-26w, Ford County, Kansas. This is the second wildcat to be started recently in the county.

Helmerich & Payne, Inc., has the drilling contract on the Stanolind Oil & Gas Co. 1 Putnam, which has been staked in SE NE NE 1-17-14w, Barton County, Kansas, 2 miles northeast of the Eveleigh pool. Same contractors will drill the Solar Oil Co. 1 Dehrens, in SW NE 6-20-15w, Barton County, north of the East Pawnee Rock pool.

Davis Brothers have the contract for drilling Rupert 1 fee, in SE NE NW 22-51n-34w, Platte County, Missouri.

Mercury Drilling Co. has the contract for six wells in the West Edmond field for Sohio Petroleum Co. They are now drilling below 5,000 ft. on the 1 Guy Casey in SW Section 9 and are moving in on the W. E. Patton in NW NW Section 27, both in Township 14n-4w.

Snowden & McSweeney Merged With Texas Gulf

FORT WORTH.—Merger of Snowden & McSweeney Co. with Texas Gulf Producing Co. became effective September 30, following approval voted by stockholders of both organizations. Snowden & McSweeney approved the merger first, and Texas Gulf, now the surviving company, took similar action last week at a special meeting in Dover, Del.

CALENDAR

October

I.P.A.A. board of directors, Dallas, Tex October 9-11. (Takes place of anniversar meeting previously scheduled.)

C.N.G.A., annual meeting, Biltmore Hotel, Los Angeles, October 13.

A.I.M.E., Pacific Section, annual fall meeting, Ambassador Hotel, Los Angeles, October 20.

National Lubricating Grease Institute Edgewater Beach Hotel, Chicago, Octobe 23, 24, 25.

PIWC, regular monthly meeting, New Interior Building, Washington, D. C., October 25.

Eighth Annual Penn State Secondary Recovery Conference, State College, Pa., October 27-28.

November

A.C.S., third national chemical exposition, Coliseum, Chicago, November 15 to 19.

PRODUCT 120
Minimizes Danger of Channeling

Your Best Buy for a "First-Time" Cement Job

BAKER
OIL TOOLS, INC.

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black—steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PERSONALS

DEAN A. McGEE

McGee Is Product Of Sunflower State

BORN, reared and educated in the Sunflower State, Dean A. McGee, executive vice president of Kerlyn Oil Co., Oklahoma City, is definitely a Kansas product. Following his graduation from University of Kansas, young McGee spent a year as instructor in the university's school of geology. Then he entered the oil business by getting a job with Phillips Petroleum Co. He was in Phillips' service 10 years, and when he left the company in 1937 to join Kerlyn he was chief geologist. Kerlyn's name originally was Kerr-Lynn & Co., Robert S. Kerr, present governor of Oklahoma, and R. H. Lynn being active figures in the organization. McGee was made vice president in charge of the geological and production departments, and he continued to hold that office until 1942, when he was advanced to his present post.

McGee was born in Humboldt, Allen County, March 30, 1904, and he received his rudimentary education in that town. After completing the Humboldt High School course he matriculated in the engineering school at University of Kansas, where he fitted himself for a career in oil.

Herb Fritzie, drilling superintendent for Arabian American Oil Co., has returned to Saudi Arabia after spending his leave in California. While in San Francisco he saw his son, a member of the U. S. Marine Corps now bound for the Pacific combat zone. Another son was lost in the invasion by American forces in the Mediterranean area.

John R. Banning has been named district engineer for The Asphalt Institute in the territory comprising Montana, eastern Washington, Idaho, Wyoming, North Dakota, western South Dakota and Utah, with office in Billings, Mont. Banning was highway commissioner for the city and county of Denver.

J. K. Murphy, who has served on the geological staffs of several oil companies, has been appointed chief geologist for Norbla Oil Co., Tulsa. Murphy received his technical education at Missouri School of Mines.

W. W. Wilson has joined the scouting staff of Sinclair Prairie Oil Co. in Midland, Tex., filling a vacancy created when **Elijah Midkiff** entered war service.

H. J. WILSON

H. J. Wilson has been appointed manager of the marine department, Associated division, Tide Water Associated Oil Co. He succeeds **George Zeh,** who retired after 42 years with the company. Wilson's 25 years' service began in the construction department. Later he became district engineer for the San Joaquin Valley, California, and in 1923 was transferred to the home office at San Francisco as assistant superintendent of sales construction and maintenance. In 1925 Wilson was made supervisor of fire protection for the entire Associated division. He has been coordinator of defense activities since 1941, acting as liason with Army, Navy and civilian defense authorities and cooperating with Petroleum Administration for War.

John C. Bumgarner, for the past 2½ years general manager of Lawson Petroleum Co., Tulsa, has joined Wood River Oil & Refining Co., Inc., Wichita, Kans., as controller and treasurer, effective October 16.

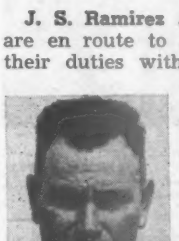
J. S. Sawyer has been appointed manager of the asphalt sales department of Shell Oil Co., Inc., New York, to succeed the late David Waxman. Sawyer is a member of American Society of Testing Materials, North Atlantic Highway Engineers and The Asphalt Institute.

DR. E. F. DAVIS

Dr. E. F. Davis, vice president of Shell Oil Co., Inc., in charge of exploration and production activities west of the Rocky Mountains, has been appointed to the newly created position of chief consulting geologist for the Shell group of companies. Dr. Davis will have headquarters in Los Angeles, but his territory will include all of North America. He received his doctorate from University of California in 1917 and joined Shell 2 years later. He was engaged in geological exploration and in 1929 was made vice president and chief geologist. **E. D. Cumming,** who recently returned to the company after serving as director of refining for Petroleum Administration for War, succeeds Dr. Davis as vice president in Los Angeles. Cumming joined Shell in 1923 following his graduation from Alabama Polytechnic Institute.

Joseph P. Gudger, traffic manager for Gulf Oil Corp., has been chosen president of the Foreign Trades Association of Houston.

J. S. Ramirez and **H. C. Snyder** are en route to Arabia to resume their duties with the drilling department of Arabian American Oil Co. **Harry Tyner,** of the same company, is still on leave in southern California. All three were passengers aboard a Dutch ship out of Java which was torpedoed by the



J. S. RAMIREZ

H. C. SYNDER

Japs in the early days of the war. They drifted many hours in an open lifeboat before being rescued by a subchaser of the U. S. Navy.

L. P. OWINGS, JR.

Zeb P. Owings, Jr., for the past 14 years in the service of Shell Oil Co., Inc., and **Mrs. George Bole,** of Tulsa, were married recently. Owings was development manager for Shell in New Orleans, district manager in St. Louis, and recently has been assistant manager of the Indiana division, with headquarters in Indianapolis. Mrs. Bole is a daughter of Peter P. Millikin, of Millikin Brothers, oil producers and contractors in Ohio, Indiana, Illinois and Oklahoma fields.

MARKET QUOTATIONS

Prices as of October 10, 1944

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.

REFINERY GASOLINE

Octane (A.S.T.M.):	76†	70-74
Mid-Continent*	6.75	5.875
Gulf Coast	6.75	5.825
Northeast Coast		9.075
California		6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-58
Oklahoma (Group 3)	4.750	5.700
North Texas	4.375	5.250
North Louisiana	4.375	5.250
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.85
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.06

Note: Exclusive of subsidy.

A.P.I. REFINERY REPORT

Week ended September 30, 1944
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	161	3,559	439	868
Ind., Ill., Ky.	788	16,334	4,055	6,327
Okla., Kans., Mo.	387	6,814	1,574	2,037
Censored area*	2,492	35,835	22,292	24,658
Rockies	119	1,580	698	416
California	828	13,906	35,168	11,223
Total 9-30-44	4,775	78,028	64,226	45,329
Total 9-23-44	4,608	78,372	62,514	44,781
Total 10- 2-43	4,204	69,280	66,827	39,806

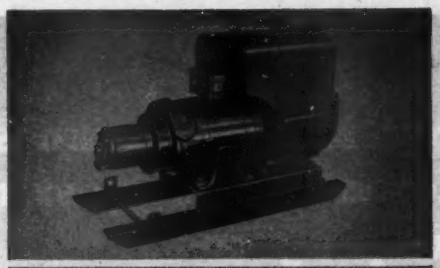
*Reports combined on East Coast, Texas Gulf Coast, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
September 30, 1944	222,390,000
September 23, 1944	221,490,000
October 2, 1943	234,643,000

*Excludes unrefinable California stocks.



Eleven basic sizes from 500 watts to 17,000 watts and 30 different types to meet all AC or DC power or lighting requirements. Housed or open models . . . available with wheelbarrow, buggy or trailer mounting. For operating a single tool or motor, or floodlight . . . or gangs of tools, groups of motors, or lighting entire areas. Easy to put in operation . . . economical to operate and maintain. Compact, portable, self-contained.

For complete details write for Bulletin 594.

MASTER
GAS-ELECTRIC
GENERATING PLANTS

COMPACT
PORTABLE

SAVE TIME AND SPEED
WORK WHEREVER POWER
OR LIGHTING IS REQUIRED

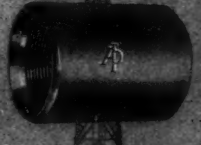
THE NATIONAL SUPPLY COMPANY
Sole Distributor to the Oil Industry throughout the World
GENERAL SALES OFFICES—TOLEDO 1, OHIO
Branch Offices in or near all major oil fields in the United States, Canada, South America and other foreign countries.
Manufactured by MASTER VIBRATOR COMPANY, Dayton 1, Ohio

PENBERTHY
SUMP PUMPS

Used wherever seepage water accumulates, the Penberthy Automatic Electric Sump Pump and the Penberthy Automatic Drainer (water or steam operated) have demonstrated their superiority in this service. Simple and rugged design—copper and bronze construction throughout.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Be SAFE with

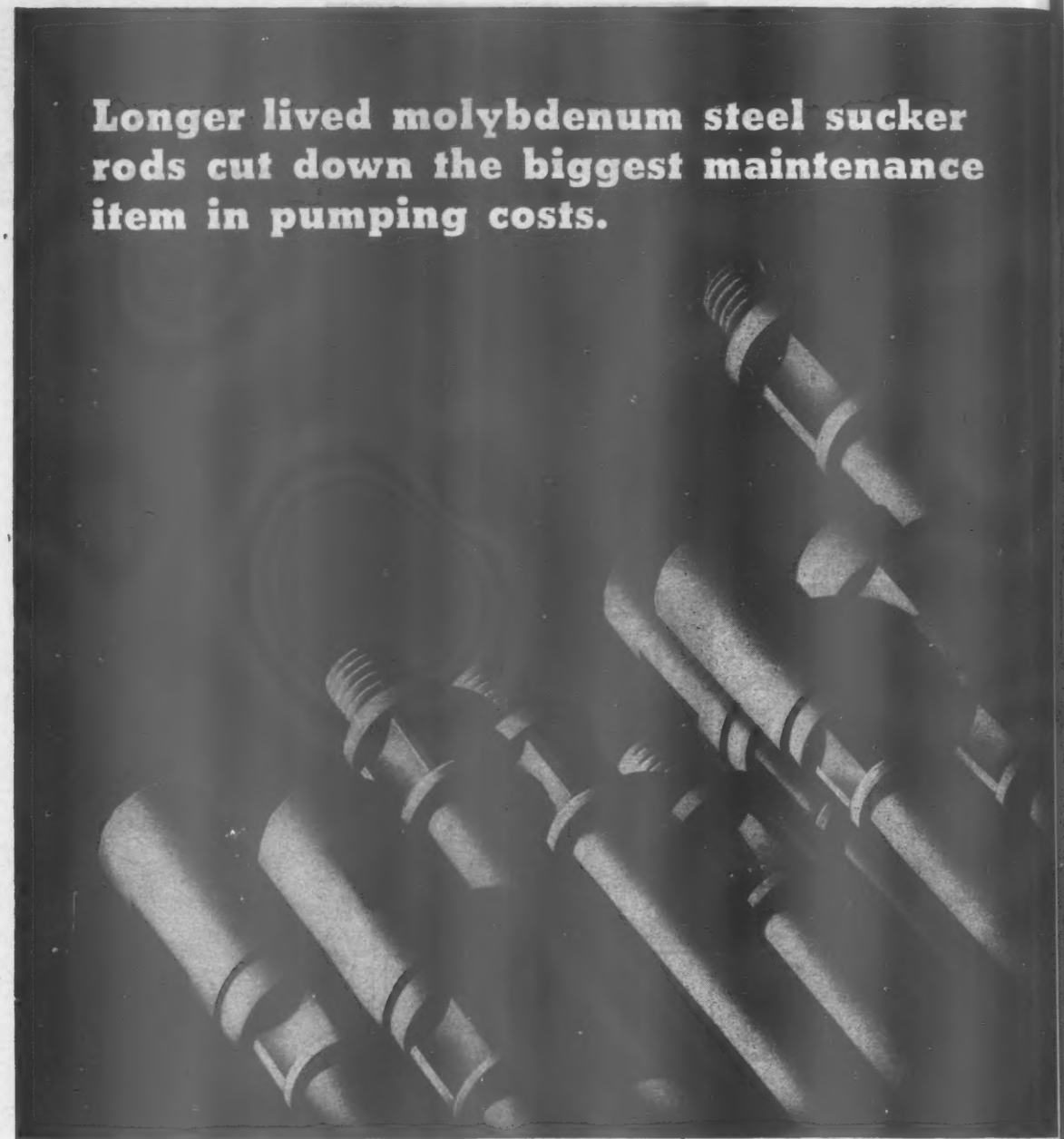


X-L QUALITY
OIL WELL TUBING
COUPLINGS

Plain or External Upset for standard tubing, made from steel. Tested by Comparator to assure strict adherence to A.P.I. standards. Available in all sizes. When ordering, please use our catalog description; it will save time and error.

WHEELING MACHINE
PRODUCTS COMPANY
WHEELING, WEST VIRGINIA

Longer lived molybdenum steel sucker rods cut down the biggest maintenance item in pumping costs.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

Industrial Items

Ross Opens Factory Office in Houston

Ross Heater & Manufacturing Co., Inc., has established a direct factory office in Houston, under the management of John A. Coleman.

Coleman was for 10 years with oil-refining industries. The office is located at 901 Citizens State Bank Building.

Penn Establishes Dallas Branch

Penn Electric Switch Co., Goshen, Ind., has opened a branch sales office in Dallas, located in the Wilson Building. The office will be managed by Ray P. Waite, who was in the public utility business until 1932 at which time he was vice president and general manager of a mid-west utility company. Since 1932 he was engaged in consulting engineering and in this capacity has done sales, sales promotion and product research work. Waite's experience also embraced oil production and refinery design and construction.

Olson Joins Lubri-Gel

Mark Olson is now associated as chief engineer for Lubri-Gel Products, manufacturers of drilling muds, with plants in McCracken, Kans., and Sweetwater, Tex. Olson formerly worked for Stanolind Oil & Gas Co. as a mud engineer.

National Appoints Hoevel Division Sales Manager

The National Supply Co. announces the appointment, effective October 1, of K. O. Hoevel as division sales manager, Mid-West division, with headquarters at Tulsa. Hoevel entered the service of the National organization in 1933 as a storeman at Seminole, Okla. In 1935 he was transferred to the Torrance, Calif., plant and later returned to the Kansas fields as field salesman and rotary serviceman. Following this service he was sales engineer at division headquarters in Tulsa and in 1941 transferred to National's Toledo plant to serve in a supervisory capacity in the construction of propulsion gears for U. S. Naval craft.

Corporate Names Changed

The corporate name of Pacific Pump Works, Huntington Park, Calif., has been changed to Pacific Pumps, Inc., and the corporate name of Mid-Continent Pump Supply Co., Tulsa, has been changed to Pacific Pumps, Inc., Mid-Continent Division, according to a recent announcement.

Hyster Makes Changes In Executive Personnel

Several important executive personnel changes have been announced by Hyster Co., Portland, Ore., and Peoria, Ill.

Philip S. Hill, who has been assistant manager of the Hyster eastern division at Peoria, returns to Portland as general sales manager. Previous to his Peoria position, Hill was manager of the Washington, D. C., office, a district representative covering the central United States and Canada, and held various sales positions dating back to 1933.

Glen M. Ede becomes assistant manager of the industrial truck division. He was for 8 years general purchasing agent for the company.

C. B. Bamberg, formerly assistant purchasing agent for 4 years, has been made purchasing agent. He has been with the company since 1937.

B. G. Nordling has been made manager of the parts department.

Three Executives Named By Philip Carey Mfg. Co.

Three appointments to executive positions in the sales and advertising departments of Philip Carey Manufacturing Co., Cincinnati, have been announced by E. W. (Pat) Smith, vice president and general sales manager.

Harold D. Bates has been named advertising and sales promotion manager. Bates was assistant advertising and sales promotion manager for Johns-Manville at New York prior to his present appointment.

Chester L. Owens has been named assistant general sales manager. For the past 10 years he has been manager of the company's Cincinnati branch.

George B. Johnston, who becomes general merchandising manager, was formerly manager of the marketing division. All three men will make their headquarters at the company's Cincinnati office.

Ambrose New J & L Houston Sales Manager

D. J. Ambrose has been appointed district sales manager of the Houston office of Jones & Laughlin Steel Corp. Ambrose has been assistant district sales manager of Jones & Laughlin's Cincinnati office since last February and except for 1 year at the Columbus office has been with J & L in Cincinnati for 23 years in various capacities. He succeeds Frank Winslow at Houston who has resigned. Howard Knobloch, who has been in the New York office since 1925, will be the new assistant district sales manager at Cincinnati.

High-Heat-Resisting Paint

Quigley Co., Inc., 527 Fifth Avenue, New York, announces its Triple-A high-heat-resisting paint, the primary use of which is on surfaces subjected to high heat, to secure maximum protection and decoration of the surfaces. The paint is shipped in the proper consistency for application. The resistance to heat depends on the surface to which it is applied. On light steel it will adhere under rapid heating and cooling up to 1,400° F. On alloy steel, brick, etc., it will stand 2,500° or over. The paint is noninflammable, nonirritating, and does not give off fumes or odors when being applied, upon drying, or when subjected to heat or flame.

Fuel-Oil Filters for Diesel Engines

Briggs Clarifier Co. has an improved standard line of round-tank fuel-oil filters for diesel engines. These new models have been added so that flow capacities range up to 500 g.p.h. For small, high-speed diesel engines, where pressure sometimes runs well above 50 lb. p.s.i. the clarifier is designed for a maximum working pressure of 100 p.s.i. and is hydrostatically tested at 150 p.s.i. For large, heavy-duty diesels, where pressure is usually between 15 and 25 p.s.i the maximum working pressure is 40 p.s.i., and clarifiers are hydrostatically tested at 60 p.s.i. Pressure drop across the refills ranges from 0 to 5 p.s.i. on all models.

Farrell Made Treasurer of American Steel & Wire Co.

John J. Farrell has been appointed treasurer of the American Steel & Wire Co., Cleveland, a U. S. Steel subsidiary. Farrell, formerly assistant treasurer of the wire company, succeeds Robert E. Lewis who recently resigned.

Guiberson Opens Houston Office

The Guiberson Corp. has opened a sales office and warehouse at 4414 South Main Street, Houston. Glen T. Thornton is manager of the office and warehouse. Don Brock and Don Whittenberg, service engineers, will cover the territory served by the Houston warehouse.

Trade Literature

Air Reduction, 60 E. 42nd St., New York.—A 12-page booklet on "How to Rebuild Worn Valves by Hardfacing," of interest to fleet operators and others whose maintenance problems have been aggravated by inability to secure replacement valves for internal-combustion engines. The company also announces that because of the wide interest in an article on "Underwater Cutting and Welding," written by H. L. Ingram, Jr., the article has been reprinted in booklet form.

Western Supply Co., 424 N. Boulder, Tulsa.—A brochure covering the company's line of shell and tube heat exchangers, atmospheric sections, submerged sections, reboilers, and prefabricated piping.

B. F. Goodrich Co., Akron.—A general booklet on the company's industrial rubber products, which can now be obtained on request. Included in the booklet are discussions of the company's line of Vibro-Insulators, devices of rubber and metal which reduce vibration, molded, extruded, lathe-cut and sponge-rubber products, etc.

Clark Bros. Co., Inc., Olean, N. Y.—A presentation of the two-cycle principle, believed to be the first instance wherein two-cycle development has been concisely recorded and graphically illustrated in brochure form. The brochure reviews two decades of the two-cycle engine, which was developed in an effort to eliminate the "waste stroke" in four-cycle operation.

American Pipe & Construction Co., P.O. Box 3428 Terminal Annex, Los Angeles.—A new catalog on Amercoat plastic coatings, which illustrates and describes the uses of Amercoat in a wide range of industries.

D. W. Haering & Co., Inc., Chicago.—An issue of the H-O-H Lighthouse, which contains an article on the application of scale and corrosion to the oil industry. Featured are Texas Co.'s achievements in drilling for oil on water such as lakes, rivers, bayous, and remote swamps in lower Louisiana, and the effectiveness of Haering glusoates in maintaining scale-free and corrosion-free boilers using Louisiana bayou waters where chlorides vary as much as 2,250 per cent. Another article describes the work of Cleveland Tankers, Inc., in transporting oil on the Great Lakes.

Chain Belt Co., 1600 W. Bruce St., Milwaukee.—New catalog, Bulletin No. 447, descriptive of Rex speed prime pumps. This is a 20-page brochure, printed in color.

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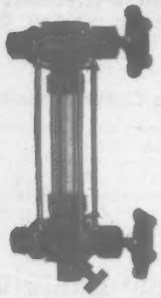
"ALL IRON"
LIQUID LEVEL GAGES



Body made from a special high strength alloy iron, shanks alloy steel and trim stainless steel. Extra heavy construction throughout, automatic and positive shut-off if glass breaks, heavy duty stuffing boxes. Conform with A.P.I.—A.S.M.E. requirements.

The "All Iron" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Navy Needs Oil Inspectors And Terminal Supervisors

NEW YORK.—The Navy's continuing need for officers qualified to serve as petroleum inspectors or as oil-terminal supervisors has prompted the Office of Naval Officer Procurement, Bureau of Naval Personnel, to issue a statement announcing this need.

Petroleum inspectors should have a degree in petroleum or chemical engineering and 2 years' actual refinery or laboratory experience in the analysis of petroleum products. In the absence of a degree, consideration is given to applicants who have had 10 years in responsible positions in the oil-refinery field or laboratory experience in connection with fuel oil and its derivatives.

Oil-terminal supervisors should have had at least 2 years of college and a knowledge of the specifications of gasoline, fuel oil, lubricants and aircraft-engine oil. They must have had at least 5 years' experience in the handling of bulk fuel oil and at least 2 years' experience in a water-terminal storage plant in a supervisory capacity. It is essential that they have a knowledge of loading and unloading tankers of large capacity.

The age bracket for petroleum inspectors is 23 to 45 years and for oil-terminal supervisors 30 to 50. Candidates must meet basic Naval physical requirements. Applications should be made at the nearest office of Naval Officer Procurement. These are located in the principal cities of the United States.

Western Kentucky

(Continued from page 143)

which had been shot. Two Union County wildcats were dry.

WESTERN KENTUCKY WILDCATS

Union County: Hiawatha 1 Reeves Waller, 20-O-19, dry at 2,818 ft. Lower Menard 1,884 ft., Barlow 2,374 ft., Renault 2,531 ft., Ste. Genevieve 2,654 ft., McClosky 2,722 ft., St. Louis 2,818 ft.

A. A. Cameron 1 B. E. Simpson, 23-P-19, dry at 2,697 ft. Lower Menard 1,821 ft., Barlow 2,306-13 ft., Renault 2,417 ft., Ste. Genevieve 2,482 ft.

Henderson County: Ashland 2 Galloway Heirs, 9-N-23, 10 mi. S of Henderson, dry at 2,292 ft. Lower Menard 1,738 ft., Tar Springs 1,852 ft., Barlow 2,206-14 ft.

S. C. Yingling 1 M. S. McCormick, 8 mi. S of Henderson, dry at 2,504 ft. Glen Dean 1,851 ft., Barlow 2,121 ft.

Daviess County: Sinclair Prairie 1 T. J. Bartlett, C N½ NE NE 7-O-28, dry at 2,100 ft. Menard 1,135 ft., Cypress 1,640 ft.

INDIANA

EVANSVILLE, Ind. — Dry holes in Greene, Jackson, Spencer and Wabash counties and a 168-bbl. well in Posey County, Carter Oil Co. 3 State-Wabash in 15-8s-15w, producing from Waltersburg and Cypress sands, made up the list of completions reported in Indiana in the past week.

5 REASONS WHY Drillers Like FESCO JEL

Fesco Jel—Schundler's Bentonite—Colloidal Drilling Clay, offers many advantages to Drillers:—

1—Forms an impervious filter cake on the walls of the hole, blocking water and avoiding mud loss.

2—Provides suspending qualities for cuttings and "weight materials."

3—Serves as a lubricant, reducing friction and abrasion by sand.

4—Eliminates corrosion of exposed metal surfaces.

5—Reduces caving by penetrating loose formations.

Fesco Jel, Schundler's Bentonite, is used by many drillers in major American and foreign fields. It is serving the foundries and is used in many processes and products.

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District Field Engineers

For Hydrogen-Sulfide Corrosion: in oil wells—
Use HYDROGEN-SULFIDE NEUTRALIZER

For Salt Brine Electrolytic Corrosion & Pitting—
Use NaCl SALT BRINE INHIBITOR (PLASTIC COATING)

When Electrolysis and hydrogen-sulfide are present in the same well
Use HYDROGEN-SULFIDE NEUTRALIZER AND ALTERNATE WITH SALT BRINE INHIBITOR

For purifying sour gas for use in gas engines and domestic
Use HYDROGEN-SULFIDE NEUTRALIZER in gas scrubbers.

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